

DOCUMENT RESUME

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ABSTRACT

Contained within this Health Activities Project (HAP) trial edition (set II) are a teacher information folio and numerous student activity folios which center around the idea that students in grades 5-8 can control their own health and safety. Each student folio is organized into a Synopsis, Health Background, Materials, Setting Up, and Activities section. Worksheets are also included for completing the activities for that particular folio topic. Examples of folio topics and activities include: balance and vision, stability in movement, balance and fatigue, limber up, stiff joints, size and age, and consumer's choice. (CS)

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HAP

II

SE 030 421

WHAT'S HAPpening?

IMAGINE . . .

Imagine that over a period of weeks you observe a small group of young people. At various times they . . .

. . . hold plastic strips against different parts of their bodies to measure external skin temperatures.

. . . play a board game that points out how taking risks affects their safety.

. . . laboriously "sit" in imaginary chairs, tiring themselves to find out how fatigue affects their ability to balance.

. . . wear blindfolds to find out how they rely on senses other than vision.

. . . measure their height and weight and combine these measurements with other data to predict how tall they are going to be.

Each time you observe these young people they are actively investigating what their own bodies can do, how their bodies work, and how their bodies change.

Wondering if you have been observing the efforts of a new experimental health clinic? Look again, because you could be watching your own class engaged in some of the activities from the Health Activities Project (HAP).



WHAT IS HAP?

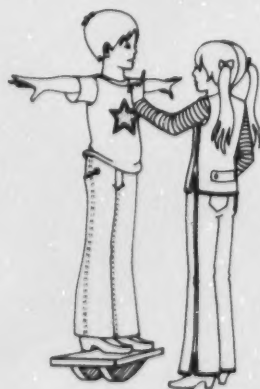
The Health Activities Project (HAP) primarily involves fifth- to eighth-grade students with their own health and safety through hands-on, discovery-approach activities. By investigating their own bodies, the students learn firsthand how their bodies function, what their bodies can do, and, most importantly, that they can make changes in the way their bodies perform. HAP's main purpose is to make students more aware of the control they have over their own health and safety.

When do you use the activities? HAP activities have been designed primarily to supplement and enrich existing school programs in health, physical education, and science. The activities have also been used successfully with a variety of other curricula and subjects, including music, math, and social science.

Is there any order to the HAP activities?

The activities in this second set of HAP materials fall under four categories or areas of emphasis. We call these categories **modules**. Other activities that supplement these modules are currently under development.

The activities may be used independently, but work best within the module framework.



BALANCE AND MOVEMENT

Balance and Vision
Blindfolded Traveler
Stability in Movement
Balance Board
Balance and Fatigue
Limber Up
Up and Away
Stiff Joints
Splint Relay

GROWTH

Equals
Size and Age
The Way We Grow
How Tall Will You Be?

For trial purposes during 1977-78, we would like you to present the activities within any given module in a sequence, one following the other, rather than randomly selecting one from one module and then another activity from another module.

What about equipment? Along with the written materials, HAP provides an equipment kit. About two-thirds of the HAP activities require special materials that would ordinarily be difficult to obtain elsewhere. The other activities require only simple, easy-to-obtain materials and can therefore be done without a kit.

Workshops. Although the activities do not require any special health expertise on the part of the leader, we recommend attending a HAP workshop before teaching HAP activities. To obtain information about the availability of HAP workshops, contact HAP at the Lawrence Hall of Science or the nearest HAP National Trial Center. (The Newsletter, available from HAP, lists the addresses of the Centers.)

How do you lead a HAP activity? Your role as a HAP teacher is that of a facilitator (one who sets the stage) of learning rather than that of an instructor. Through many classroom trials we have found that, in many situations, discovery through student activity is more successful than someone else verbally conveying knowledge to the students. The procedure that we suggest a facilitator follow is to quickly introduce the activity, demonstrate any special procedures and

DECISION MAKING

On the Spot
Risky Business
Consumers' Choice

SKIN AND TEMPERATURE

Map Your Temperature
Out in the Cold
The Great Heat Escape

equipment, and present the students with the challenge or task. Most of the allotted time should be reserved for student exploration. Trust the activity to help your students learn through their own explorations. Then follow the activity with questions and discussions that reinforce the ideas introduced.

What do you do while the students do the activity? While your students work, you have the opportunity to move about the room and spend your time with individuals or small groups. You can get involved as a participant, lend assistance when it is needed, help students record results, or ask questions that stimulate further activity.

Be flexible. Sometimes your students may become involved in explorations or ask questions that do not lead in the direction that you have planned. When this happens, be flexible. These situations can serve as interesting points of departure and can spur further exploration on the part of the students.

How do you lead the discussions? The discussion at the end of the activity is an opportunity for the students to compare discoveries, review the class results, and voice their experiences and opinions. Avoid monopolizing the discussion; act rather as a catalyst for discussion.

How do you use the questions? Look over the suggested questions at the end of the activity, and use the ones that you think will generate the most interest. Your questioning strategy should be the one that best brings out the health and safety significance of the activity to your own class. These questions, or others of your own choosing, and the information from the **HEALTH BACKGROUND** section can be used to link the activity experience with the children's personal health. One very effective technique is to give the students an opportunity to describe personal experiences that bear out the activity's health connection. For example, in **Stiff Joints** you might ask students who have had a broken arm, leg, or other bone to describe how their injuries affected their performances of everyday tasks and how they learned to compensate for the injury.

THE FOLIOS

Thoroughly acquaint yourself with the contents of the activity folio before attempting to lead the activity. Each folio is laid out in a similar format to make it easier for you to find the information you want as you move from activity to activity.

SYNOPSIS

This section provides you with a capsule description of the activity.

HEALTH BACKGROUND

This section covers the health significance of the activity. Also included in this section are definitions of terms and clarifications of the concept being covered.

MATERIALS

All pieces of equipment required for each activity are listed in this section. Easily obtainable equipment that is to be provided by the teacher is marked with an asterisk. All other equipment is provided in the kit.

SETTING UP

This section outlines what you have to do to get ready for the activity. Whenever possible, have your students assist you with the preparation.

Scheduling the Activity. This part informs you of how much time the activity will require (usually one to two class periods).

THE ACTIVITY

This section gives you suggestions on introducing the activity, demonstrating any procedures and equipment, and carrying out the activity.

DISCUSSING THE RESULTS

This section includes a number of suggested questions that are designed to bring out the health significance of the activity. Choose among them and add any questions of your own.

ADDITIONAL CHALLENGES

These additional challenges may be used to extend the scope of the activity for the whole group or for interested students.

HINTS

Over the years we have discovered some general approaches that improve the flow of learning when using the experiential science approach employed by HAP. You probably know and use some of these techniques already, but for those of you who are unfamiliar with the experiential approach, we mention them here.

1. **Equipment.** Make sure that all of the required equipment is present. Do not assume that equipment is in the box without checking first.
2. **Preparation.** Check the **SETTING UP** section of the folio to find out if there are preparations to be made *before* you initiate the activity. For instance, in the **SKIN AND TEMPERATURE** activities the strip thermometers must be sterilized before each activity.
3. **Distributing the Materials.** Do not distribute the materials until you have finished the introduction and any demonstrations, and the students have been primed with a challenge and are ready to begin. If distributed earlier, equipment often diverts the students' attention from any instructions you may still have to give them.
4. **Interaction.** Hands-on discovery-approach activities generate a great deal of student-to-student verbal interaction. While participating in HAP activities, children spontaneously exchange observations and ideas, so be prepared for louder than normal noise levels. This activity-oriented peer interaction is a valuable part of the learning process in HAP activities, so don't feel that you have to discourage it. You should, of course, keep it within reasonable noise limits, i.e. the children don't have to shout.

WE WANT TO HEAR FROM YOU

The HAP activities are trial editions; they are not finished products by any means. If you are not working through a National Trial Center, we would like to hear from you directly. We need to find out from you what works, what doesn't work, and how we can improve the activities. Are there health areas or concerns for which you would like to see other HAP activities developed? We want to develop health activities that fit student and teacher needs and interests. Please send your comments to:

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Remember, you make it *HAP*pen!

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HAP
Trial Edition

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BALANCE AND VISION

SYNOPSIS

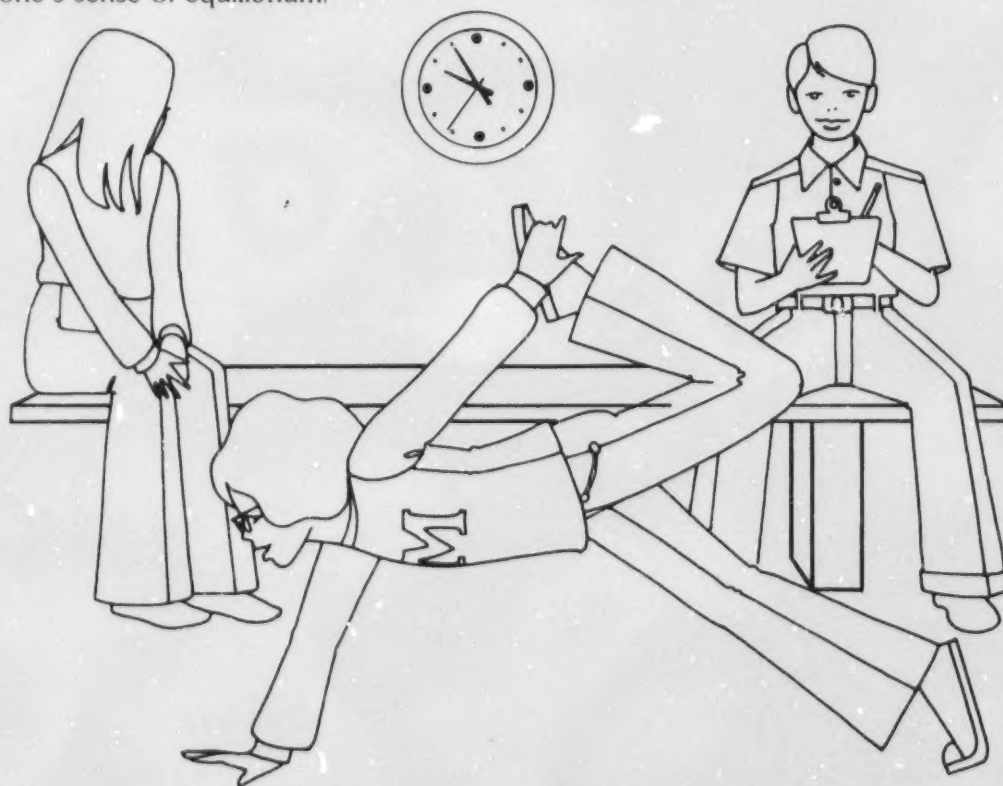
By attempting to maintain their balance, first with their eyes open and then with their eyes closed, the students discover how much they rely on visual cues to maintain their balance.

HEALTH BACKGROUND

Balance is primarily a function of the inner ear, which contains sensors that respond to the head's position in relation to the earth's gravity. Balance disorders can be caused by nerve or muscle impairments and viral or bacterial invasions. Alcohol and drugs can temporarily affect one's ability to balance properly. Spinning rapidly about is another way of temporarily upsetting one's sense of equilibrium.

Visual contact with the surrounding environment plays a part in maintaining balance. Ice skaters, springboard divers, gymnasts, and dancers use a technique called "spotting" to minimize dizziness while they are spinning around. As a gymnast turns on a balance beam, she focuses on a single point as long as she can, then quickly turns her head and focuses on that point again. Vision assists people in accurately placing their feet while walking, running, jumping, or avoiding obstacles.

The balancing abilities of your students will vary somewhat. Gross deviations from the general class range may indicate a medical problem. In such cases it is advisable to privately alert the school nurse.



MATERIALS

For each student:

- 1 copy of the Student Sheet*

For the class:

- 6 three-meter-long pieces of rope
- 1 marking pen*
- 1 clock with second hand
- masking tape*
- chalk*
- 1 duplicator master of the Student Sheet, "How Vision Affects Your Balance"

*Provided by the teacher

SETTING UP

Scheduling the Activity. *Balance and Vision* requires forty-five to fifty-five minutes

Preparing for the Activity

1. The day before the activity, ask the students to wear loose clothing that permits a full range of movement. Girls should wear pants for this activity.
2. Make a copy of the Student Sheet for every student.
3. Double each rope twice. Mark the loops with a marking pen so that the rope is divided into quarters.
4. Arrange tables, chairs, and desks so that each team of three students will have at least a 1.5m $\times$ 1.5m square of open space in which to work.
5. In the center of each team's work space, use chalk or the masking tape to make a rectangle 35cm $\times$ 25cm. This rectangle serves as a foot outline.
6. Draw these three charts on the chalkboard. The students will record their results on these charts.

7. During the second part of the activity you will be setting up six rope stations. Each rope station needs a 4m $\times$ 1.5m floor space. (See **Part Two: The Rope Walk.**)

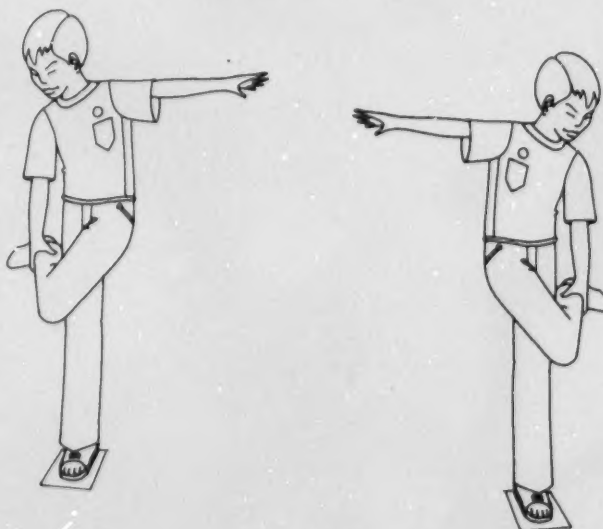
THE ACTIVITY

Part One: Body Positions

Introducing the Activity. Explain to the students that they will be trying to maintain their balance in three different body positions. They will attempt to hold each body position for thirty seconds, first with their eyes open and then with their eyes closed. The students have the option of balancing with their shoes off or on.

Demonstrating the Body Positions. Show the students the three positions in which they will be attempting to maintain balance.

1. **Balancing on the preferred foot.** The preferred foot is identified as the one you would use to kick a ball. Place your preferred foot inside a foot outline. Balance on this foot while holding your other foot with the hand that is on the same side as your preferred foot.



2. **Balancing on the other foot.** Repeat the above procedure using your other (nonpreferred) foot.

January 12, 1978

HAP SET II

BALANCE AND VISION

This is to inform you of an omission in the Balance and Vision Activity in HAP Set II. On page 2, in the "Preparing for the Activity" section, the following illustration should appear after #6

NUMBER OF SECONDS BALANCING

ON PREFERRED FOOT	
With Eyes Open	With Eyes Closed

ON NON-PREFERRED FOOT	
With Eyes Open	With Eyes Closed

ON ONE FOOT AND ONE HAND	
With Eyes Open	With Eyes Closed

We apologize for any inconvenience this omission may have caused you.

BALANCE AND VISION

Student Sheet

Name _____

HOW VISION AFFECTS YOUR BALANCE

My preferred foot is my ^{right} foot. (Circle one.)
left

How long can you hold each position? (30 seconds maximum)

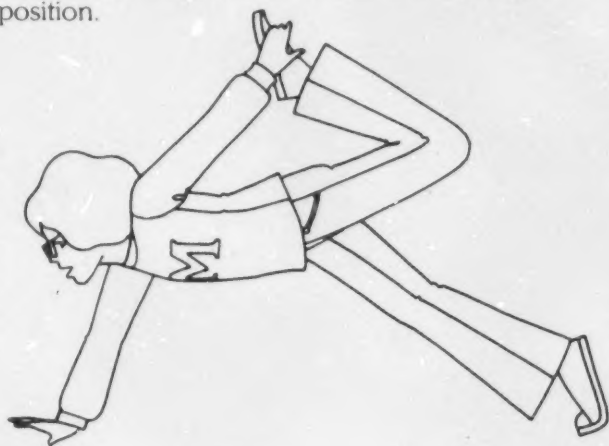
	ILLUSTRATION	EYES OPEN	EYES CLOSED
1. Stand on your preferred foot.		 seconds	 seconds
2. Stand on your other foot.		 seconds	 seconds
3. Balance with either your right hand and right foot on the floor or your left hand and left foot on the floor.		 seconds	 seconds
4. Rope Walk (Circle one.)			

With eyes open I walked $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ the entire length of the rope before stepping off.

With eyes closed I walked $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ the entire length of the rope before stepping off.

3. Balancing on one hand and one foot.

Place one foot inside a foot outline. Bend forward and lean on the hand that is on the same side as the foot on which you are balancing. Reach behind your back and grab the other foot with your free hand and hold this position.



Demonstrating the Timing Procedure

1. Choose one student to be the **balancer**, another to be the **checker**, and tell the rest of the students that they will act as the **timer** for this demonstration.
2. Ask the **balancer** to step into the foot outline and balance on one foot as demonstrated.



3. Tell the **timer** to watch the balancer and say "START" when the balancer says she is ready

and "STOP" when (a) her other foot touches the floor, (b) the foot on which she is balancing crosses any part of the foot outline, or (c) she opens her eyes (for closed-eyes trials).

4. Acting together as the **timer**, the class watches the second hand on the clock and silently counts the number of seconds that elapse between the "START" and "STOP" signals. Poll the class for the number of seconds that elapse.

5. The **balancer** should step out of the foot outline after each trial.

6. Repeat the same procedure, but this time ask the balancer to keep her eyes closed. Again poll the class for the number of seconds. Continue these practice trials with the two students switching roles until most of the students are reporting the same number of seconds.

Organizing the Class

1. Give each student a copy of the Student Sheet, and go over it with the students.
2. Remind the students that thirty seconds is the maximum time for each trial and that the **balancer** must step out of the outline before starting a new trial.
3. At each turn, one team member takes both an eyes-open and an eyes-closed trial in one body position. All three team members should explore that position before the team moves on to the next position.
4. Point out the charts you have drawn on the chalkboard. Tell the students that they can record their results on these charts as they finish with each body position.
5. Divide the class into teams of three, and direct each team to a work area.
6. Give the teams about twenty minutes to complete their trials for all three positions.
7. Total and average the results on the chart while the teams complete the rope walk in the next part of the activity.

Part Two: The Rope Walk

After all the teams have recorded their results on the board, announce that you have another challenge for them: the rope walk.

Demonstrating the Rope Walk

1. Tape the ends of one rope on the floor so that the rope is in a straight line.
2. Starting with one foot on the rope, show the students how to walk the rope by placing the heel of your other foot directly in front of and against the toe of your first foot. Try to walk the entire length of the rope in heel-toe fashion.
3. Now walk the rope with your eyes closed.



Setting up the Stations. Set up six rope stations, and assign two teams to each station.

Walking the Rope

1. Challenge the students to first walk the rope with their eyes open and then with their eyes closed.
2. Limit the students to three tries with their eyes closed.
3. Tell the students to record on their Student Sheets the lengths of rope they were able to cover with eyes open and with eyes closed. (The students can use the quarter marks on the ropes as guides when their walking distances do not total full rope lengths.)

DISCUSSING THE RESULTS

1. How did you feel while balancing in different positions and walking the rope with your eyes closed?
2. What happened to your balance when your eyes were closed? (More movement, dizzy, had to concentrate more.)
3. How did closing your eyes affect the length of time you could balance? (Go over the differences between the eyes-open and eyes-closed results recorded on the charts.)
4. When your eyes were closed, which was easier: balancing on one foot or on one foot and one hand? Why do you think that was so?
5. Poll the students as to how many could walk across one-quarter, one-half, three-fourths, and the entire length of the rope with their eyes open. With their eyes closed? Why was the rope walk so difficult?
6. Have you ever lost your balance in the dark or when you couldn't see very well? Describe the situations.
7. What besides vision might affect your balance?

ADDITIONAL CHALLENGES

1. Find out if practicing can improve your ability to balance without vision.
2. Explore the effects of vision on balance in other body positions.

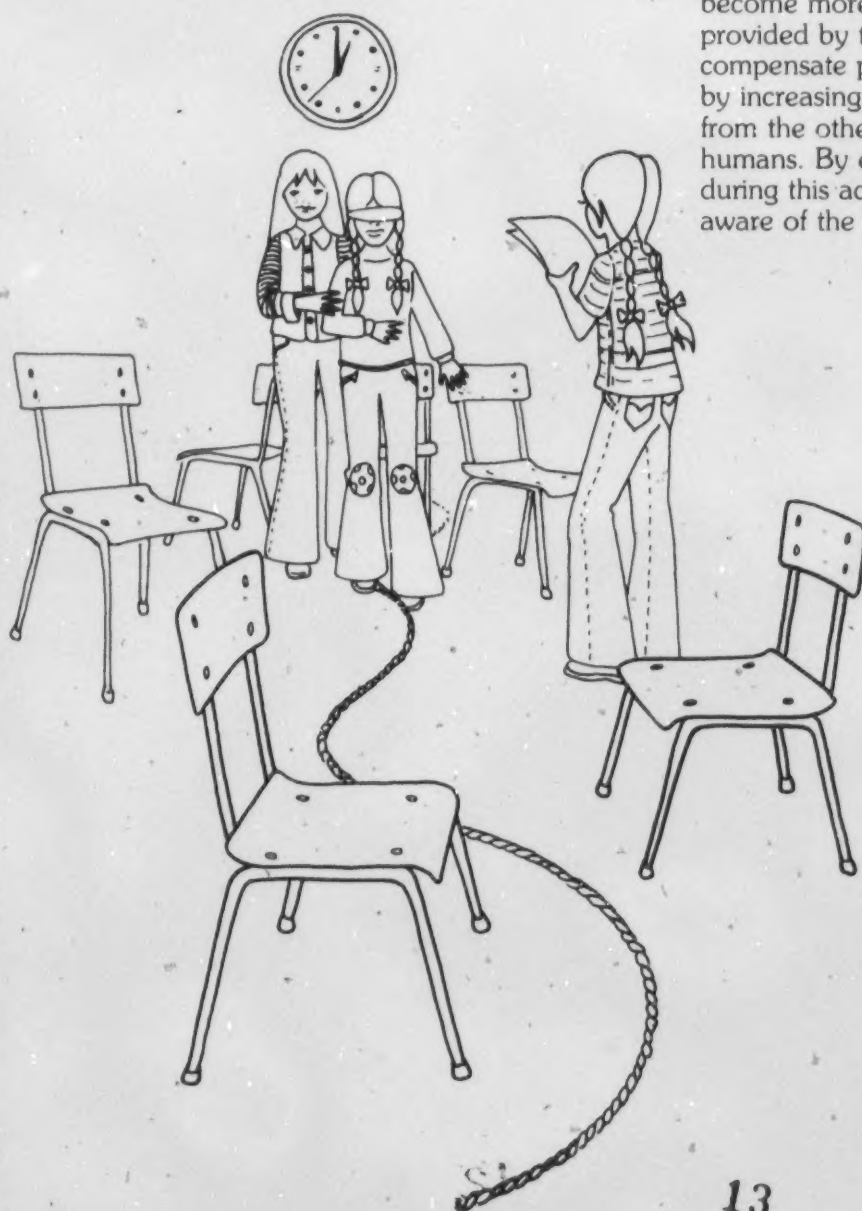
BLINDFOLDED TRAVELER

SYNOPSIS

Blindfolded students move through an obstacle course. By practicing in order to improve their course times, the students learn to depend on senses other than sight.

HEALTH BACKGROUND

The operation of the sensory systems of sight, hearing, touch, and smell contribute to the healthy functioning of the nervous system. When deprived of the use of one sense, we become more dependent on the information provided by the other senses. The ability to compensate partially for one type of sensory loss by increasing the concentration on information from the other senses is an important ability of humans. By experiencing a deprivation of vision during this activity, the students become more aware of the adaptive abilities of their bodies.



MATERIALS

For the class:

- 1 wall clock with second hand
- 10 blindfolds
- 2 ropes, each three meters long
- 1 "Does Your Time Through the Course Improve With Practice?" chart
- 100 red dots
- 1 "Averaging Method" Technique Card
- 1 duplicator master of the Student Sheet, "Blindfolded Traveling"

*Provided by the teacher

SETTING UP

Scheduling the Activity. This activity may require two class sessions. Plan to collect part of the obstacle-course data during the first class session and the remainder during a second session.

Preparing for the Activity

1. **Obstacle Courses.** Set up two identical obstacle courses in the classroom before the class enters. You may set up any type of course. One possibility is to have each student follow a path similar to the one represented in this obstacle course.



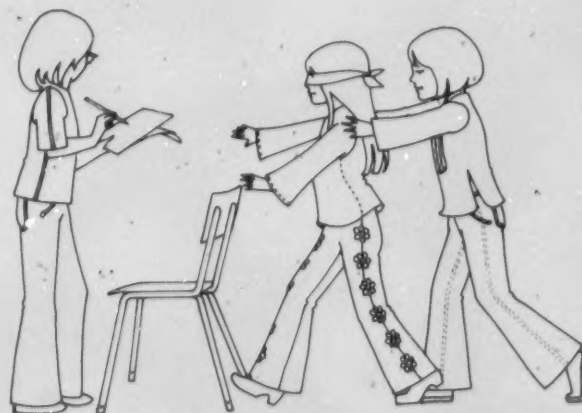
In this course, the student would pass on the right of the first chair, on the left of the second chair, between the next set of chairs, then under the table, and finally along the top of the rope, keeping one foot on the rope at all times. Leave one meter of space between obstacles. Both obstacle courses *must* be the same in order for the class data to be consistent.

2. **Graph Materials.** Post the graph where all the students can see it. Place the dots near the graph, or tape them to the wall on either side of the graph.

3. Make a copy of the Student Sheet for every student.

THE ACTIVITY

Introducing the Activity. If the students have completed *Balance and Vision*, review the results with them. They probably concluded that balance is easier to maintain with sight than without it. In that activity, the students did not move. In this activity they will be moving blindfolded through an obstacle course and trying to maintain their balance.



BLINDFOLDED TRAVELER

Student Sheet

Name _____

BLINDFOLDED TRAVELING

1. Record your times for each trial in the boxes below.

BLINDFOLDED TRIALS

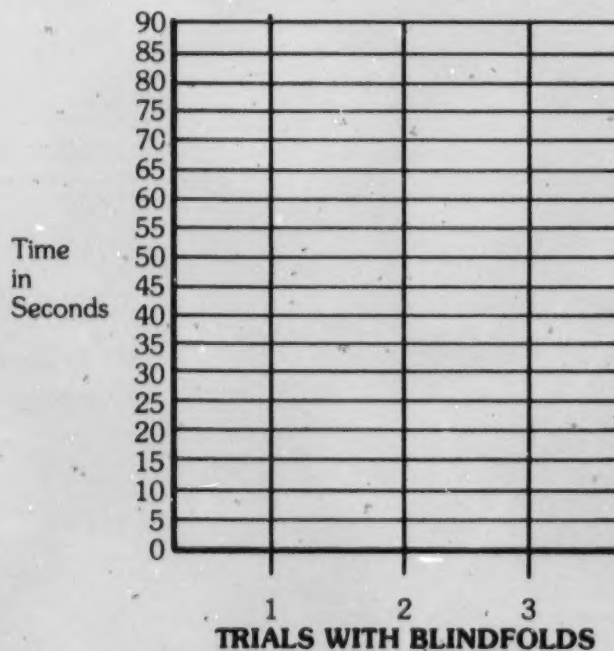
Time in seconds =

Trial
#1

Trial
#2

Trial
#3

2. On the graph, place an X next to your time for each trial.



3. Connect the X's to make a line showing how your times changed.

4. How much did your time improve? To figure out, go through these steps:

a. My initial time (Trial #1) = _____ seconds

b. My best time from any of the
blindfolded trials = _____ seconds
(minus) _____

c. My total improvement = _____ seconds

**Blindfolded Traveler
Limber Up
Size and Age
The Way We Grow**

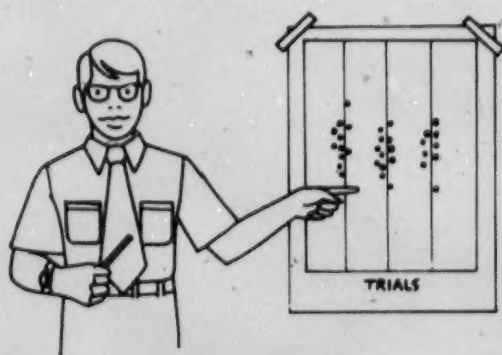
AVERAGING METHOD

Technique Card

This averaging technique eliminates the necessity of calculating an arithmetical average. Instead, this technique helps you locate a point that the class thinks best represents all the dots in one column (or row) of data.

To get this average:

1. Point out the highest and lowest dots in a column (or the two end dots in a row, if your data run horizontally), so that the students are aware of the entire range.
2. Place your finger at the top dot in the column (or at the last dot in a row).
3. Look at the class. *Do not look at the chart.*



4. Tell the students to raise their hands when your finger reaches the point that best represents all the dots (the middle or average).

5. Move your finger slowly down the column (or back across the row). You will have to move your finger down the entire length of the column (or along the entire row of dots) to make sure that you don't stop at a point where a lot of hands are raised and miss a point further down (or back) where more hands might be raised. Then move your finger back to the area where a lot of hands were raised. Move your finger slowly up and down (or back and forth) around that area to find the precise point where the most hands are raised.

6. Mark that point with an X. Follow this procedure for each column (or row) of dots. Connect the X's with a felt-pen line.

They will be guided once through the course while blindfolded and then given three trials. Make sure the students understand that **they are not competing with anyone** on these trials. Tell them that they are only trying to find out if practice improves their own course times. The compensatory strategies they develop to improve their times will increase their awareness of how they can use senses other than sight.

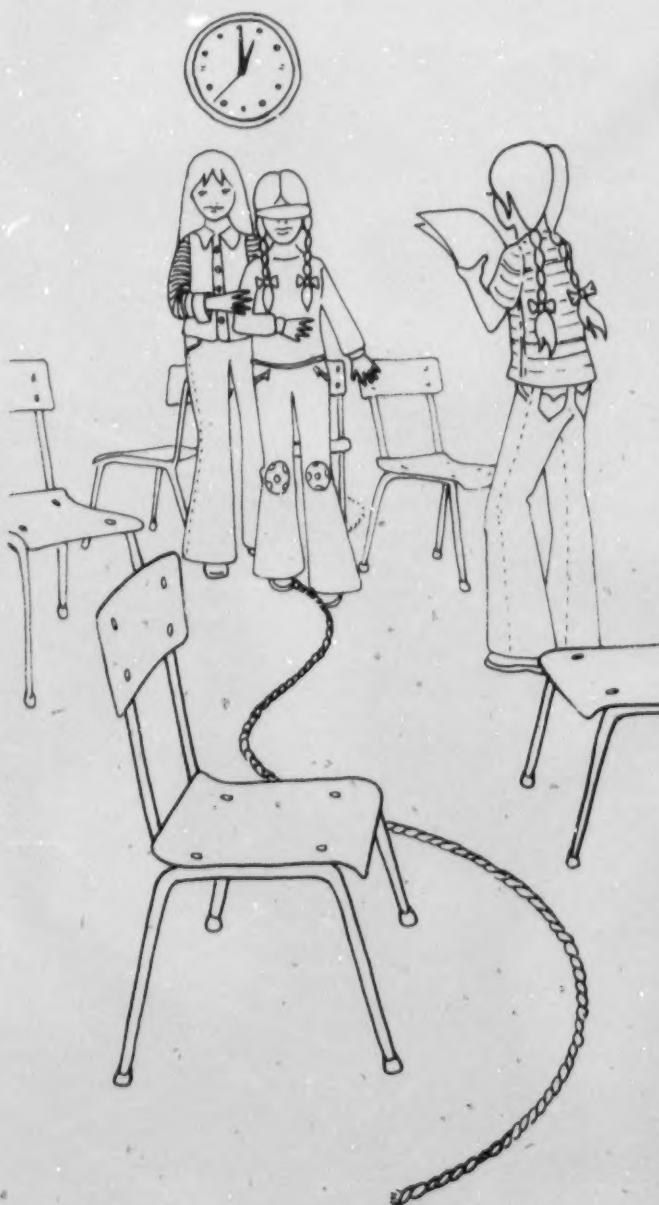
Safety. In order to call the students' attention to possible safety hazards, ask them what precautions they might take in walking from the classroom to the school cafeteria (or another well-known room) if they were blindfolded. What problems might they encounter?

Organizing the Class. Divide the class into teams of three. Each team member will have an opportunity to be a **traveler**, a **safety guide**, and a **timer**. The **traveler** is the student moving through the course. The **safety guide** leads the traveler through the course in the first (untimed) trial. During the timed trials, the safety guide verbally cautions the traveler about hazards in order to prevent accidents. The safety guide does *not* tell the traveler how to move through the course. Encourage the students to anticipate accidents and to caution the traveler *before* she has an accident. The **timer** starts and stops each trial, times the trials using the wall clock, and records the time for each trial on the traveler's Student Sheet.

Demonstrating the Procedure. Distribute copies of the Student Sheet and explain it to the students. Demonstrate the activity procedure with three students, each one taking a different role. The traveler for this demonstration will use the two demonstration trials as his guided trial and his first timed trial. Also show the students how to place the dots on the class chart. (Find the trial number, and then move up to the number of seconds the traveler took to move through the course.)

Moving Through the Course

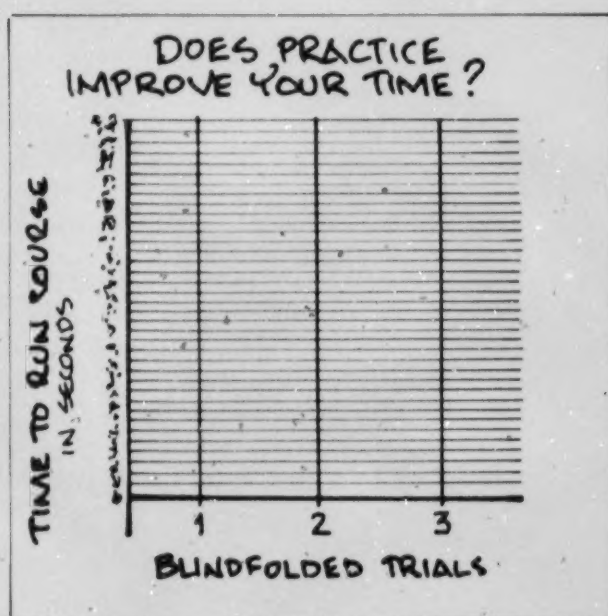
1. One student on the team is guided through the course and then immediately takes her three timed trials.



2. After each traveler completes her set of trials, the members of the team switch roles. Each team member should have a turn as **traveler**, **timer**, and **safety guide**.

3. The entire team collects its data before placing dots on the class chart.

4. Each student records the results of her three trials by placing a red dot on the appropriate horizontal line in each of the three columns (Trial 1, Trial 2, and Trial 3). Students should not overlap dots but should place them to the right of any existing dot.



Organizing the Data. After the students have recorded their data, tell them that they now can find the average time for each trial. (Use the "Averaging Method" Technique Card for the procedure to follow in finding these averages.)

DISCUSSING THE RESULTS

Once the averages have been determined, start a discussion with a general question such as: "How did you feel while you were moving blindfolded through the course?" During the discussion, ask the students specific questions such as:

1. What is the average time for each column?
2. What is the general direction of the line on the class graph? What does the line tell you about the effect of practice on course time?
3. Between which trials did the class show the most improvement?
4. Did the improvement line level off at some point in the trials (a point where times did not get any better)?
5. What strategies did you develop for moving through the course faster?
6. Was touch or hearing most helpful? How?

STABILITY IN MOVEMENT

SYNOPSIS

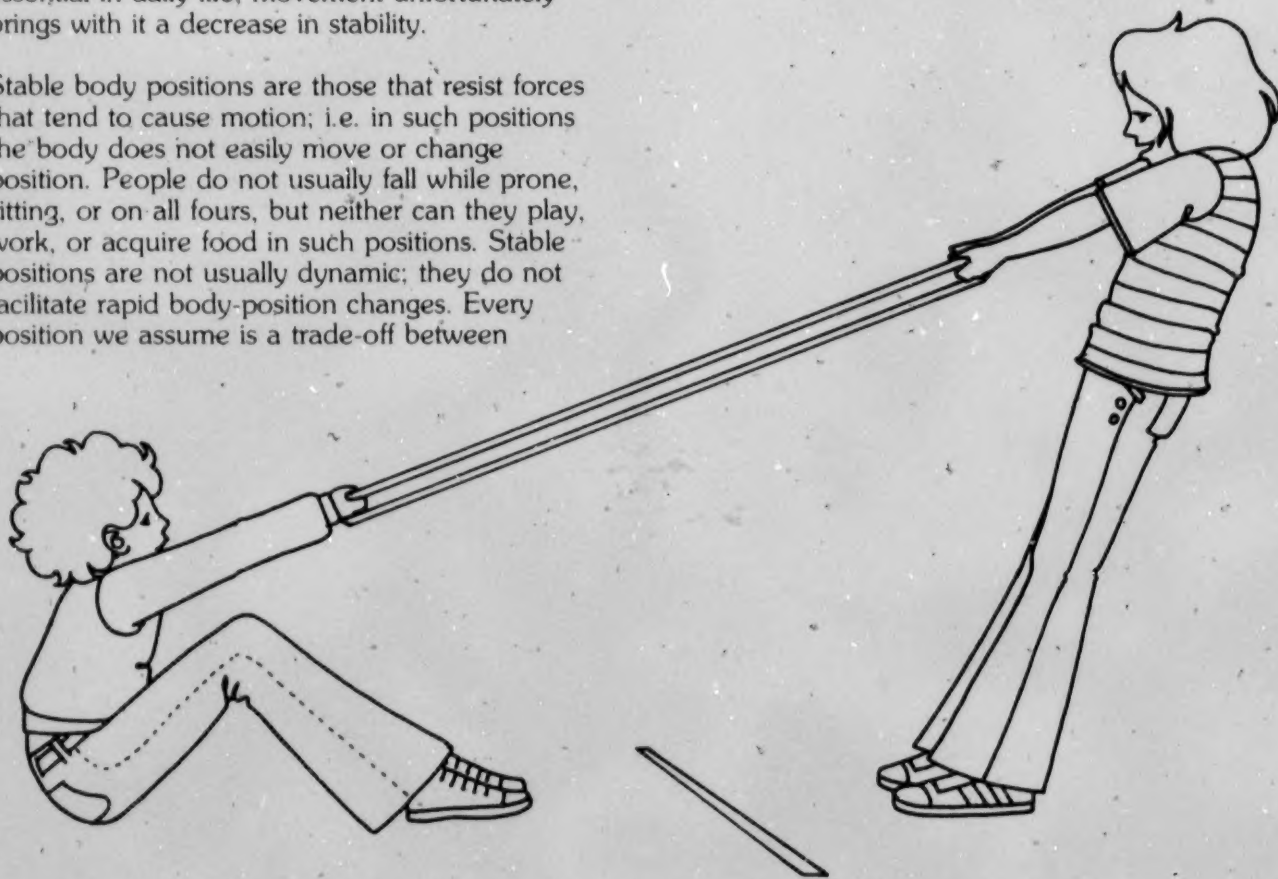
The students explore various stable and unstable body positions on a fixed surface. By participating in a tug of war, they discover that in order to have any stability in movement they must actively balance.

HEALTH BACKGROUND

Accidents are the most frequent cause of injury to children. Many of these accidents stem from slips, skids, and the resulting falls. Although essential in daily life, movement unfortunately brings with it a decrease in stability.

Stable body positions are those that resist forces that tend to cause motion; i.e. in such positions the body does not easily move or change position. People do not usually fall while prone, sitting, or on all fours, but neither can they play, work, or acquire food in such positions. Stable positions are not usually dynamic; they do not facilitate rapid body-position changes. Every position we assume is a trade-off between

stability and freedom of movement. To have stability without remaining always in a stable position, one must actively balance by **compensating** (making moving adjustments). Keeping one's balance usually consists of assuming a series of varied positions (making compensatory movements) in order to remain upright. These compensatory movements are usually rapid adjustments such as shifts in the position of feet and weight. Maintaining balance is a dynamic act relying on the complex feedback system of sensors in the feet, muscles, inner ears, nerves, and eyes.



MATERIALS

For each team of four:

- 1 three-meter-long piece of rope, tied in a loop
- 1 piece of chalk*

For the class:

- 2 full-length pencils*, sharpened
- tape* or a pencil eraser*

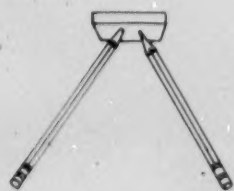
*Provided by the teacher

SETTING UP

Scheduling the Activity. This activity requires one class period. **Stability in Movement**, dealing with balancing on a stable surface, should precede **Balance Board**, which deals with balancing on a moving surface.

Preparing for the Activity

1. Make arrangements to use the gym, multipurpose room, a large hallway, or a large playground area.
2. Construct a "pencil person" by pushing the points of the two equal-length, sharpened pencils into a soft eraser or taping the tips together.

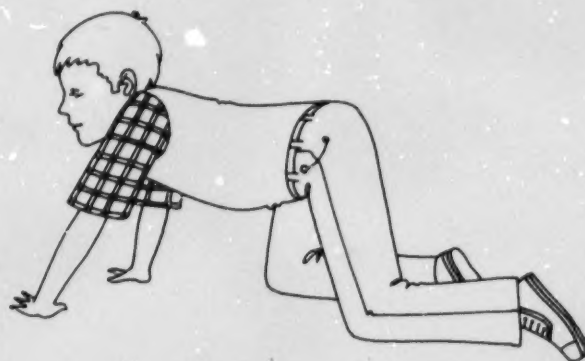


THE ACTIVITY

Introducing Stability

1. Explain to the students that they will be exploring different body positions to find the ones that are most stable. You might explain the term **stable** by giving the example of a four-legged table as being stable, i.e. it resists tipping over. Stable things are steady, don't fall over, etc.

2. Ask the students to assume some very stable positions. The children usually sit, lie down, get on all fours, or assume other positions low to the ground.



3. While the students are exploring positions, encourage them to observe each other's positions and describe the similarities in the positions. Some students will assume positions on their feet only. You might wish to gently push one of these students to point out how unstable he is compared to students who have greater body contact with the floor.
4. Now ask the students to assume positions in which they are the *least* stable. Encourage the students to pinpoint the similarities between these new postures, e.g. body in an upright position, only one foot on the ground, the body leaning over, etc.



Introducing Balance

1. Explain to the students that both a book lying on a table and a person lying on a floor are in stable positions. But a human on two feet is more stable than a "pencil person" placed upright on its "feet." Demonstrate this point by trying to balance the pencil person on a flat surface so it stands on its two "feet."

2. Encourage a discussion about the differences between a human on two feet and a pencil person on two feet. Children frequently use the term **balance** to explain the difference between the abilities of pencils and people to remain upright.

3. Ask the students to relate some of their bad experiences with balance. Following their contributions, ask: "Why don't humans stay in perfectly stable positions all their lives? No one would ever fall over, slip, slide, or skid if they always remained stable. Since balancing is more risky than remaining stable, why do we do it?"

4. Explain to the students that in order to be stable while on only one or two supports (usually the feet), **balancing** is required.

5. Ask one student to come to the front of the group and **stand** in the position in which she can balance the best. Tell the class that you will, without creating a dangerous situation, push the student off balance. Tell the students to observe how the balancer recovers her balance. Push steadily and release quickly; push from several different angles.

6. How did the balancer make foot and weight adjustments? What seems to be a good standing position in which to maintain stability (straight, stooped, or crouched)?

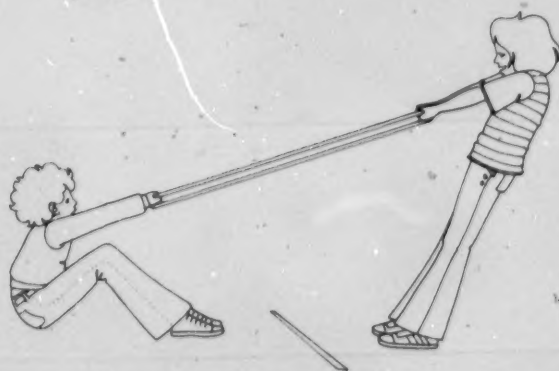
7. Introduce the term **compensate** as a word that means to adjust or to make up for a loss of something. In this case, a balancer compensates for a loss of stability by making moving adjustments. The balancer may compensate for the push and maintain her balance by leaning into the pusher or by rapidly changing her foot position. A pencil person does not have this ability.

Tug of War

Introducing the Tug of War. Explain to the students that they are going to have a Tug of War in order to learn more about how they compensate for loss of stability and thus maintain balance.

Tug-of-War Rules

1. The class is divided into groups of four.
2. Two out of each four will tug while the other two observe the tuggers compensating in order to maintain or regain balance.
3. The tugger who first crosses the line between him and his opponent loses.
4. Once a tug of war is over, the tuggers switch positions with the observers.
5. The group members continue switching roles and partners until you tell them to stop.



Playing Tug of War

1. Divide the class into groups of four. The four students in each group should be as closely matched in weight as possible.
2. Tell the students to leave the rope tied in a loop and to grasp only one thickness of rope. *The rope must not be doubled around a hand!* Give each group a rope and a piece of chalk with which to draw a "no cross" line.
3. Let the students begin. After the initial excitement wears off (after each pair has tugged two or three times), ask the students to try out different positions, e.g. wide versus narrow stances, facing in other directions, one tugger low to the ground and one standing upright.

DISCUSSING THE RESULTS

Encourage the students to share their experiences with each other. The following questions may be of help to you in generating a discussion of stability.

1. How is your balance affected by:
 - a. Keeping your body low to the ground versus standing upright?
 - b. Assuming a wide versus a narrow stance?
 - c. Facing in opposite directions?
2. How does foot position affect stability?
3. If your opponent stopped pulling, how would you compensate?
4. How is balancing different than just being stable? (Balancing requires compensatory movement.)
5. How does compensating from a crouched position compare to compensating from an upright position? (It is harder to compensate from a very low position.)
6. What kinds of activities require very stable positions? Which activities make use of free but balanced positions?

BALANCE BOARD

SYNOPSIS

The students find out how various body positions affect the length of time they can balance on an unstable surface.

HEALTH BACKGROUND

In maintaining your balance, different foot positions provide different compromises between the stability of your base of support and your ability to compensate quickly. The further apart you place your feet, the more stable your base of support becomes, but you decrease your ability to compensate. Surfers, for example, keep their feet apart for stability while riding a wave, whereas downhill skiers keep their feet close together so they can change direction quickly.

Maintaining your balance can also be affected by the position and mobility of your arms. With your arms extended and free to move, you can quickly redistribute your body weight to maintain your balance. If your arms were full of packages and you started to slip, you would have difficulty keeping your balance.

Visual contact with the surrounding environment also plays a part in maintaining balance by allowing you to orient yourself to moving and non-moving objects. Ice skaters and dancers (and children playing games in which they spin around) often focus their eyes on a single point to minimize dizziness and to keep their balance.

By investigating variables that affect the ability to balance on an unstable platform, such as a balance board, the students gain information they can use in potentially dangerous, unstable situations such as skateboarding, getting into a small boat, or standing up on a chair.



MATERIALS

For each student:

- 1 copy of the Student Sheet*

For the class:

- 11 balance boards
- 1 "Balance-Board Timing Procedure" Technique Card
- 1 clock with second hand
- 1 duplicator master of the Student Sheet, "Finding Your Best Balancing Position"

*Provided by the teacher

SETTING UP

Scheduling the Activity. Session One

requires one forty- to sixty-minute class period.

Session Two requires one or two class periods.

This activity is best sequenced between

Stability in Movement and **Balance and Fatigue**.

Preparing for the Activity

1. Select an area (classroom, hallway, gym) with enough clear space for all eleven boards to be used safely at the same time. Suitable surfaces include tile and wood floors, thin carpeting, and smooth concrete. Avoid asphalt paving and textured concrete because these surfaces damage the boards.
2. Position the clock so that all the students will be able to see the second hand.
3. Make a copy of the Student Sheet for every student.

THE ACTIVITY

Session One: Experimenting with Balance Boards

Introducing the Activity

1. Ask the students for their ideas on what "keeping your balance" means.
2. Show the students a balance board and what

"maintaining balance" on the board consists of: no part of the body and neither end of the board touching the floor. (You may wish to have a student demonstrate the balancing.)

3. **Safety.** Caution your students to keep their heels on the board and to avoid pivoting the board as they would a skateboard. Otherwise the board might slip out from under them. Also tell the students not to hold anything in their hands while balancing on the board.

4. Tell the students that they will be exploring a variety of positions to find the one in which they can balance the longest on the boards. Demonstrate (or have a student demonstrate) the following positions: standing, sitting, kneeling, and lying stomach-down on a balance board.

Doing the Activity

1. Divide your class into groups of three. Give each group a balance board and a balancing area in which to work.
2. Give the students time to experiment with all four of the positions. (Every student should explore each position for at least a minute.) All three group members should experiment with one position before the group moves on to the next position. Tell the students to find two positions in which they can easily keep their balance on the board.
3. After the students have made their selections, offer the following challenge: **FIND THE BODY POSITION IN WHICH YOU CAN BALANCE LONGEST ON THE BOARD.**
4. Introduce the timing procedure outlined on the "Balance-Board Timing Procedure" Technique Card. Have the students follow this procedure to find the body position in which they each can balance for the longest time.

Session Two: Investigating the Effects of Foot Position, Arm Position, and Eye Focus

Introducing the Activity

1. Review **Session One** by having four or five volunteers demonstrate their most successful balancing positions. Ask the students how their

BALANCE BOARD

Student Sheet

Name _____

FINDING YOUR BEST BALANCING POSITION

CHECK ONE BOX FOR FEET, ARMS, AND EYES.

I predict my best standing position will be while my feet are ☐ APART, ☐ TOGETHER, my arms are ☐ FREE, ☐ FOLDED, and my eyes are ☐ FIXED, ☐ MOVING.

1. Test your predictions by completing these three tasks.
2. Circle your best position for each task. Remember, *best* position means you balanced in it *longest*.

TASK 1

FEET APART

FEET TOGETHER

Finding my
best foot
position

Trial	Time
1	_____ seconds
2	_____ seconds
3	_____ seconds
TOTAL	= _____ seconds

Trial	Time
1	_____ seconds
2	_____ seconds
3	_____ seconds
TOTAL	= _____ seconds

CIRCLE THE BETTER OF THE TWO TRIALS.

TASK 2

ARMS FREE

ARMS FOLDED

Finding my
best arm
position.
(Do this
task with
feet in
their best
position.)

Trial	Time
1	_____ seconds
2	_____ seconds
3	_____ seconds
TOTAL	= _____ seconds

Trial	Time
1	_____ seconds
2	_____ seconds
3	_____ seconds
TOTAL	= _____ seconds

CIRCLE THE BETTER OF THE TWO TRIALS.

TASK 3

EYES FIXED

EYES MOVING

(looking at just one spot)

(following a moving finger)

Finding my
best eye
position.
(Do this
task with
feet and
arms in
their best
position.)

Trial	Time
1	_____ seconds
2	_____ seconds
3	_____ seconds
TOTAL	= _____ seconds

Trial	Time
1	_____ seconds
2	_____ seconds
3	_____ seconds
TOTAL	= _____ seconds

CIRCLE THE BETTER OF THE TWO TRIALS.

Balance Board

Balance and Fatigue

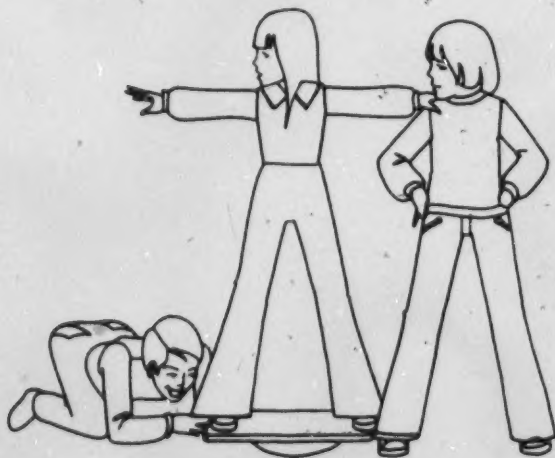
BALANCE-BOARD TIMING PROCEDURE

Technique Card

Procedure for Three Students:

Demonstrate the following timing procedure with a team of three students. Assign one student to be the **balancer**, one to be the **timer**, and one to be the **checker**.

1. The **balancer** steps onto the board. Caution the students to keep their heels on the board and to avoid pivoting the board as they would a skateboard. Otherwise the board might slip out from under them. Also caution the students not to hold anything in their hands while they are on the board.
2. The **timer** stands next to the balancer and watches the second hand of the clock.
3. The **checker** positions himself about one-and-a-half meters *behind* the balancer (to avoid being kicked accidentally) and kneels down to watch the edges of the board.



4. When the **balancer** feels steady, she simultaneously lets go of the timer's shoulder and says "START!"

5. At the "START" signal, the **timer** begins silently counting the seconds ticked off by the second hand on the clock. While counting, the timer should step out of the balancer's way.

6. The **checker** watches the board and says "STOP!" when either side of the board touches the floor. The **balancer** steps off the board after each trial. (In this way, confusion over when each trial begins and ends is minimized.)

7. The **timer** records the number of seconds that passed between the "START" and "STOP" signals.

As the three students demonstrate the timing procedure, ask the rest of the class to check the timer's reports and the checker's calls.

Procedure for Two Students:

If you have one board for every two students, you can use the two-person timing procedure: the **timer's** role remains the same, but the **balancer** takes on the role of checker, giving both the "START" and "STOP" signals herself.

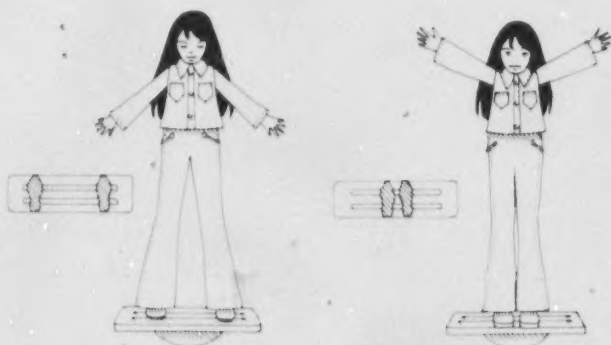
body positions affected their ability to balance on the boards.

2. Tell the students that they are now going to find out how long they can balance on the boards while standing with their feet and arms in different positions, and while focusing their eyes in different ways.

Demonstrating the Three Tasks. Conduct the demonstrations *before* handing out the balance boards. (Otherwise the students quickly become involved with the boards and miss the demonstrations.) Show the students how to stand on the boards in the following positions.

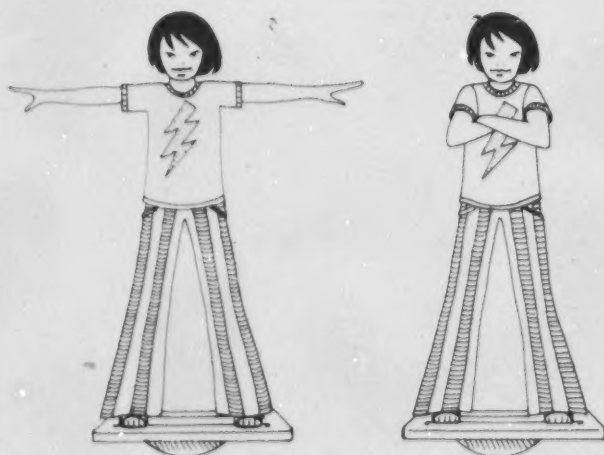
1. Foot Position

- Feet apart (outside of the rivets) on the board.
- Feet together in the middle of the board.



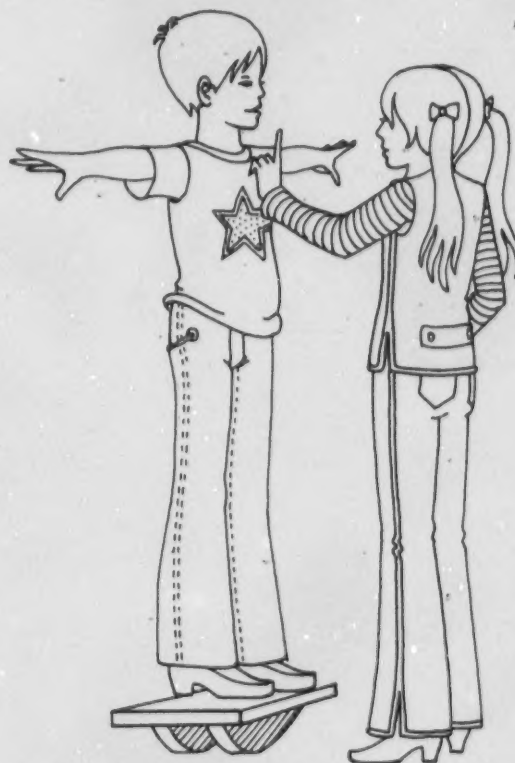
2. Arm Position

- Arms free to move.
- Arms folded across the chest.



3. Eye Focus

- Eyes fixed on one spot at eye level in the room.
- Eyes following a moving finger. (Have one student move her finger from side to side about 30 centimeters in front of the balancer's face, telling the students to watch how he follows her finger with his eyes.)



Doing the Activity

- Give each student a copy of the Student Sheet. Ask the students to predict on their Student Sheets whether they will balance on the board longer with their feet spread apart or together, their arms folded or free to move, and their eyes fixed on a single point or following a moving object.
- Outline the sequence of tasks to the students. (See the Student Sheet.)
- Review the timing procedure (from the "Balance-Board Timing Procedure" Technique Card), and establish a maximum time limit of thirty seconds for a single trial. (If you are working on a carpeted floor, which makes balancing easier, you may want to increase the time limit to sixty seconds.)

4. Divide the class into groups of three, and give one balance board to each group.
5. Allow the groups ten minutes to practice balancing and using the timing procedure before they start the trials.
6. For speed and consistency, have each balancer complete his six timed trials for a particular task before switching roles with his two partners. All three group members should complete a task before the group moves on to the next task. You may need to briefly redemonstrate the different tasks as the students move through the activity.

Summarizing the Results

1. Have the students complete their Student Sheets by circling their "best" balancing positions for each of the three tasks.
2. Poll the students to find out how many students balanced best in each of the foot, arm, and eye positions. Put the results on the chalkboard and circle the combination of positions that the most students found "best" for balancing.

Feet Apart 7	Feet Together 13
Arms Free 18	Arms Folded 2
Eyes Fixed 16	Eyes Moving 4



DISCUSSING THE RESULTS

1. Why do you think you were able to balance longest in your "best" position?
2. What are some things you do that require good balance?
3. What accidents have you or your friends had that involved a loss of balance?

CHALLENGING YOUR BALANCE

1. Try balancing on the board while your eyes follow someone's finger moving up and down and then moving side to side. Which makes balancing more difficult for you? Why? How does the speed of the finger movement affect your ability to balance?
2. Have a partner stand on the balance board with you. How long can the two of you cooperatively maintain your balance? What differences and similarities can you see between the best body position for individual balancing and the one for team balancing?

BALANCE AND FATIGUE

SYNOPSIS

Students discover how muscle fatigue affects their ability to balance.

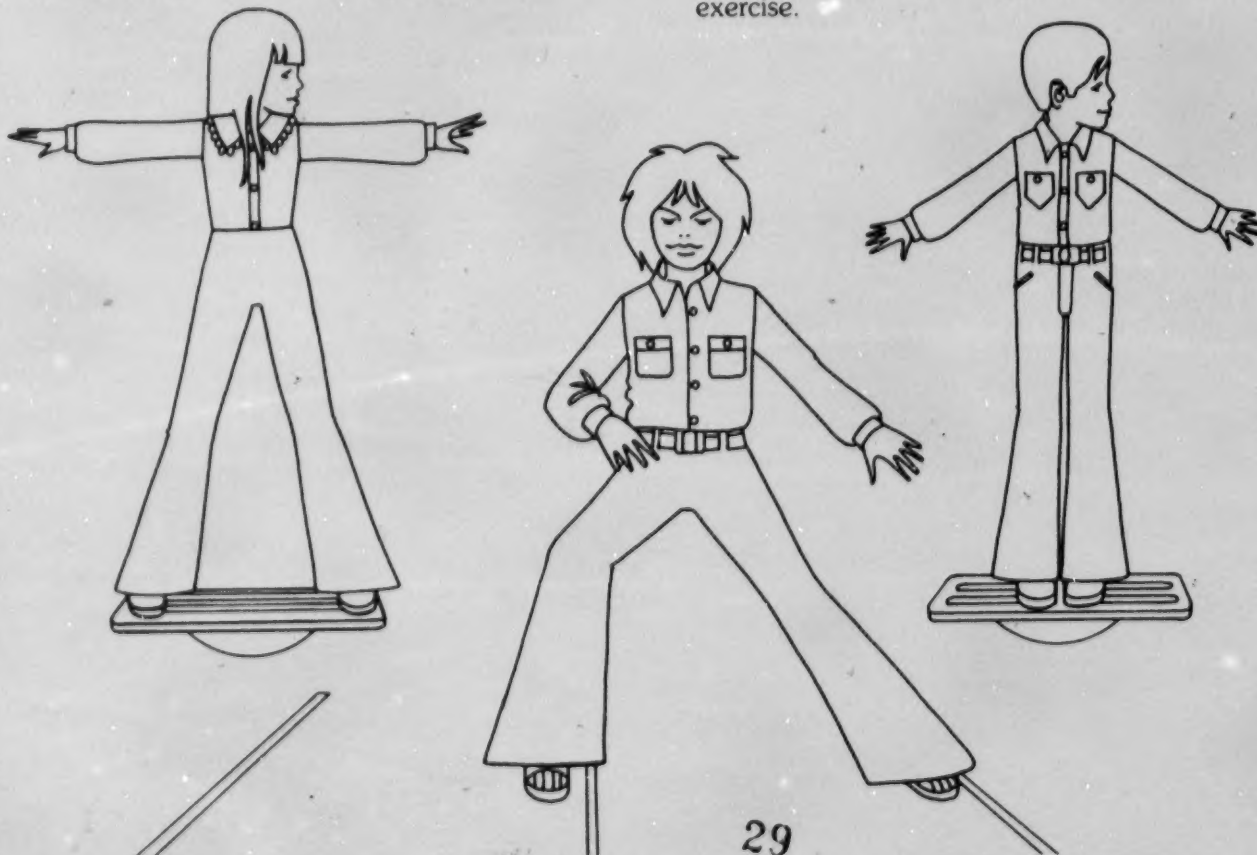
HEALTH BACKGROUND

Most people over the age of six or seven have such an automatic, effective sense of balance that they perform their everyday activities without any conscious awareness of the role balance plays in their lives. People usually become aware of the importance of balance only when its normal function is disrupted. For example, spinning rapidly upsets one's sense of equilibrium and causes dizziness. Certain

medications, drugs, and inner-ear infections can also cause dizziness.

Muscle fatigue is another condition that limits one's ability to maintain good balance. Although fatigue thresholds vary between individuals, strenuous physical activity eventually produces muscle fatigue in everyone. Fatigued muscles lose the ability to respond quickly in dynamic (moving) balance adjustments. For example, a person who rides a skateboard or jumps over an obstacle when his leg muscles are tired increases his chances of losing his balance and injuring himself.

This activity alerts students to one of the potential hazards of over-exertion by giving them the opportunity to discover how their ability to balance is affected by strenuous exercise.



MATERIALS

For each team of three students:

- 3 copies of the Student Sheet*
- 1 balance board

For the class:

- 1 clock with second hand
- 1 meter tape
- 1 roll of masking tape*
- 1 "Balance-Board Timing Procedure" Technique Card
- 1 duplicator master of the Student Sheet, "Balancing and Exercise"

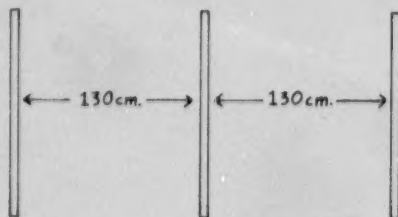
*Provided by the teacher

SETTING UP

Scheduling the Activity. Conduct this activity within two weeks after doing **Balance Board**. Older students can complete this activity in one forty- to sixty-minute class period. Younger students may need two periods.

Preparing for the Activity

1. **Balance-Board Area.** Use the same type of area you used for **Balance Board**. Lots of room and a smooth floor surface are the key requirements.
2. **Imaginary-Chair Area.** The students will need a flat wall to lean against for this exercise.
3. **Side-Step Area.** Set up four side-step areas. For each area, tape a set of three one-meter-long lines 130 centimeters apart on the floor. Leave at least one meter between each side-step area to prevent collisions between side-steppers.

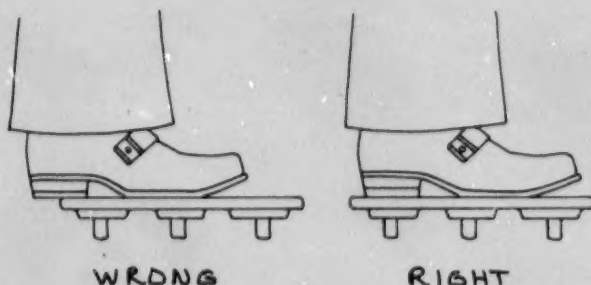


4. Make a copy of the Student Sheet for every student.

THE ACTIVITY

Introducing the Activity. Ask your students if they have ever been physically exhausted. Have a few students describe things they have done that have made them tired. How do they think tired leg muscles would affect their ability to balance? Tell the students that to find out, they are going to check their balancing ability before and after exercising strenuously.

Safety. Caution your students to keep their heels on the board and to avoid pivoting the board as they would a skateboard. Otherwise the board might slip out from under them.



Starting the Activity

1. Quickly review the arm and foot position results and the eye focus results from **Balance Board**, and the timing procedure from the "Balance-Board Timing Procedure" Technique Card.
2. Divide the students into teams of three, and distribute the balance boards. Give the students ten minutes to select and practice their best balancing position (the position each student can maintain the longest). Tell the students that they are not restricted to standing positions. They may choose any position in which they can support themselves with one or both legs, for example: kneeling, standing, or crouched.

Balance Trials Before Exercise

1. Distribute the Students Sheets to the students. Go over the "Balance Trials Before Exercise" section on the sheets with the class.
2. Remind the students that they must use the same balancing position for all of the trials.

BALANCE AND FATIGUE

Student Sheet

Name _____

BALANCING AND EXERCISE

1. Balance Trials Before Exercise

Record the number of seconds you balanced in each of the three Before-Exercise trials.

TRIAL

TIME

1

seconds

2

seconds

3

seconds

+
PLUS

EQUALS =

Total Number of Seconds

2. Balance Trials after Exercise

Circle the exercise you will do:

Imaginary Chair



Side Step



Record your exercise results:

I held the chair position for _____ seconds.

I crossed _____ outside lines during one minute of side stepping.

Record the number of seconds you balanced in each of the three After-Exercise Trials.

TRIAL

TIME

1

seconds

2

seconds

3

seconds

+
PLUS

EQUALS =

Total Number of Seconds

Balance Board Balance and Fatigue

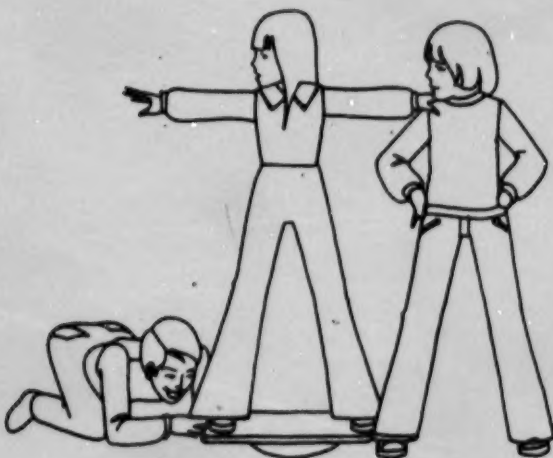
BALANCE-BOARD TIMING PROCEDURE

Technique Card

Procedure for Three Students:

Demonstrate the following timing procedure with a team of three students. Assign one student to be the **balancer**, one to be the **timer**, and one to be the **checker**.

1. The **balancer** steps onto the board. Caution the students to keep their heels on the board and to avoid pivoting the board as they would a skateboard. Otherwise the board might slip out from under them. Also caution the students not to hold anything in their hands while they are on the board.
2. The **timer** stands next to the balancer and watches the second hand of the clock.
3. The **checker** positions himself about one-and-a-half meters *behind* the balancer (to avoid being kicked accidentally) and kneels down to watch the edges of the board.



4. When the **balancer** feels steady, she simultaneously lets go of the timer's shoulder and says "START!"

5. At the "START" signal, the **timer** begins silently counting the seconds ticked off by the second hand on the clock. While counting, the timer should step out of the balancer's way.

6. The **checker** watches the board and says "STOP!" when either side of the board touches the floor. The **balancer** steps off the board after each trial. (In this way, confusion over when each trial begins and ends is minimized.)

7. The **timer** records the number of seconds that passed between the "START" and "STOP" signals.

As the three students demonstrate the timing procedure, ask the rest of the class to check the timer's reports and the checker's calls.

Procedure for Two Students:

If you have one board for every two students, you can use the two-person timing procedure: the **timer's** role remains the same, but the **balancer** takes on the role of checker, giving both the "START" and "STOP" signals herself.

3. Have the teams complete their before-exercise trials. Each team member completes his three trials, the team members switch roles and a new balancer takes her turn until everyone has finished their before-exercise trials.

4. Ask the teams to sit down.

Balance Trials After Exercise

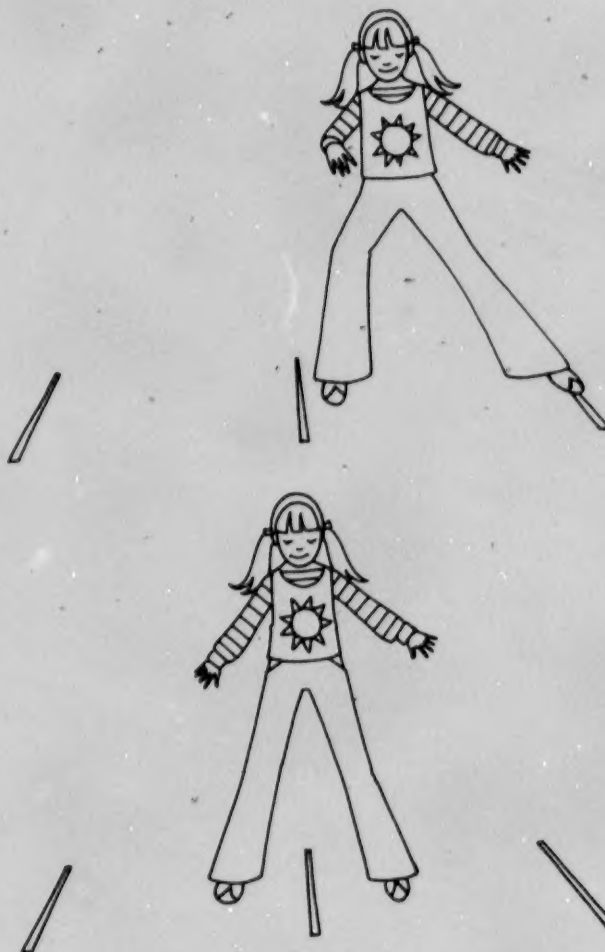
1. Explain that during this next part of the activity, one team member at a time will exercise heavily for one minute and then **immediately** complete three balance trials. (If they wait, recovery occurs.)

2. Demonstrate the imaginary-chair and side-step exercises to the class.

Imaginary Chair. Stand about shoulder width away from a flat wall with your back facing the wall and your feet together. Lean your back against the wall, bring your buttocks against the wall while bending your knees, and slide your back down the wall until you reach a sitting position. Your thighs should be parallel to the floor, your calves should be perpendicular to the floor, and your arms should hang free.



Side-Step. Stand with one foot on each side of the center line. At the signal "Ready, Go," side-step to one side until one foot touches or crosses the outside line, then side-step back across the center line until the other foot touches or crosses the other outside line. Continue back and forth, always facing the same direction the tape lines run. Tell the students to note that your feet do not cross while side-stepping.



3. Assign half of the teams to "sit" in the imaginary chair and the other half to side-step.
4. Go over the "Balance Trials After Exercise" section of the Student Sheet with the class, and ask the students to circle the exercise they are going to do.
5. Explain that one partner should time the exercise period and the other partner should count the line crossings (side-step) or watch for correct position (imaginary chair). Both partners should be ready to time the balance trials immediately after the exercise period ends.
6. Have the students run in place for thirty seconds to warm up for the exercises. Then challenge the imaginary-chair sitters to hold their position for a full minute, and the side-steppers to cross as many lines as they can in a minute. Remind the teams to start the balance trials immediately after the exercise.
7. Let the teams begin. Circulate to make sure that the exercises are being done correctly and that exercisers start their balance trials immediately after exercising.

DISCUSSING THE RESULTS

On a chalkboard, record the number of sitters who balanced longer, balanced a shorter amount of time, and balanced the same amount of time after the chair exercise. Tally the side-steppers in the same fashion. One way of recording the results is illustrated here.

Chair	Side Step	
- 9	- 8	- Student didn't improve after exercise
+ 2	+ 1	+ Student improved after exercise
0 2	0 1	0 Student balanced the same after exercise

Questions to Ask

1. Did you balance better or worse after exercise?
2. How did you feel after sitting in the chair? After side-stepping? How many of you really felt tired?
3. Did the exercises improve your balancing ability? Why or why not?
4. Did the exercises have the same effect on everyone's balancing ability? Why might that be? (Different levels of fitness.)
5. After playing basketball (or tennis or baseball) for two hours, do you think it would be a good idea to ride down a steep hill on your skateboard? Why or why not?
6. If you were on a track team competing in the 100-meter dash, the high jump, and the pole vault, would you want to rest between events? Why or why not? In what order would you want to take the events? Why?
7. Describe situations in which you were tired and lost your balance.

ADDITIONAL CHALLENGES

Discover how the following conditions affect your balancing ability:

1. Spinning rapidly around four times.
2. Closing one or both eyes.
3. Holding two heavy books in one hand.

LIMBER UP

SYNOPSIS

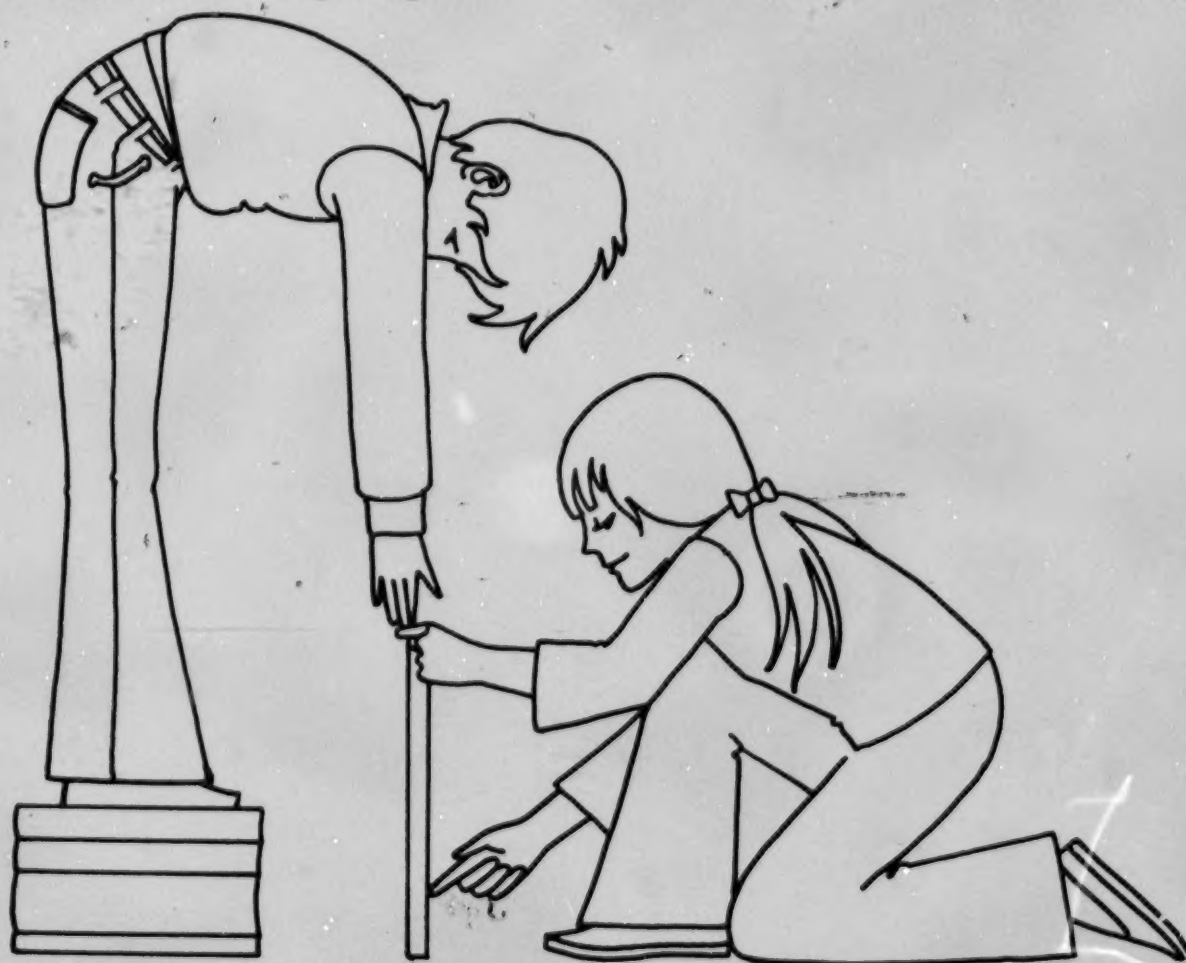
The students discover how stretching exercises affect their range of movement.

HEALTH BACKGROUND

A muscle consists of many individual fibers bound together by connective tissue. A natural tightening of this connective tissue occurs in many people because their daily lives involve only limited movement. This tightening

prevents a muscle from extending to its full, relaxed length. Repetitive, progressive, stretching exercises can stretch the connective tissue between the fibers and allow the muscles to extend to their full length. As a result, the bones to which the muscles are attached can extend farther. Hence, stretching exercises can increase the body's range of movement.

Sudden, vigorous muscle activity, however, may cause muscle pulls, i.e. the tearing of connective tissue or muscle fibers. For this reason, gradual stretching exercises are usually recommended as warm-ups for more strenuous activity.



MATERIALS

For each team of two:

- 1 30-cm ruler
- scratch paper*

For the class:

- 30 hardbound books* (2 to 3 cm thick and wide enough for children to stand on)
- 1 "Distance Between Floor and Fingertips" chart
- 20 red dots
- 20 green dots
- shoe box or other container*
- 1 "Stretching Exercises" Technique Card
- 1 "Averaging Method" Technique Card

*Provided by the teacher

SETTING UP

Scheduling the Activity. The introduction, stretching, and data collection require one forty-to sixty-minute class period. The discussion may take part of another class period.

Preparing for the Activity

1. The day before the activity, encourage the students to wear loose-fitting clothing that will allow them to move freely and sit on the floor.
2. Tape the class chart to the wall. On the top scale, place a green dot in front of the word "Non-Exercisers." On the bottom scale, place a red dot in front of the word "Exercisers."
3. Make a stack of textbooks 15-cm high at five places around the room.
4. Cut as many dots apart as you have students; half the dots are to be green, the remaining dots red. Leave each dot attached to the backing. Place the dots in an opaque box. (The students will each be drawing one dot at random.)
5. **Note:** You might want to inform your students' P.E. teachers when you do this activity so they can capitalize on the students' increased awareness of the value of stretching as a warm-up.)

THE ACTIVITY

Introducing the Activity. Tell the students that they are going to find out how well they can bend by seeing how close they can get their fingertips to the floor.

Demonstrating the Measuring Procedure

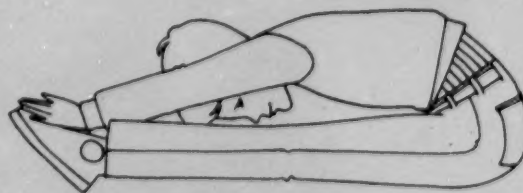
1. Stand on a platform of books. With your feet close together and your legs straight (no bent knees), try to touch your fingertips to the floor.
2. Warn the students that bobbing or bouncing in this position can damage their muscles.
3. Have a student use a ruler (0-cm end on the floor) to measure the distance between the floor and your fingertips. The distance measured must be the shortest distance that you can maintain for at least three seconds.

Measuring Fingertip-to-Floor Distances

1. Divide the class into pairs, and give each pair of students one ruler.
2. Each student measures how close his partner's fingertips come to the floor. Any student who can't reach the 30-cm end of the ruler should simply consider her measurement to be 30 cm. Have the students record their measurements on scratch paper.
3. After all the students have measured their fingertip-to-floor distances, gather the students to introduce the stretching experiment.

Planning the Stretching Experiment

1. Ask the students for suggestions on ways to bend over farther (thus decreasing the distance between their fingertips and the floor). If they do not suggest stretching exercises, mention the possibility.

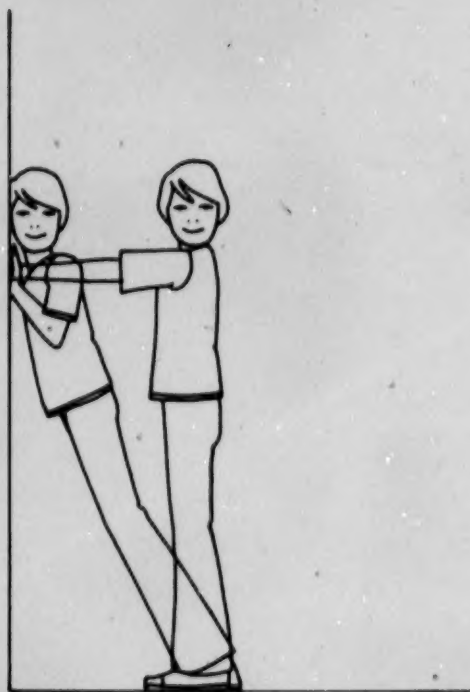


Limber Up

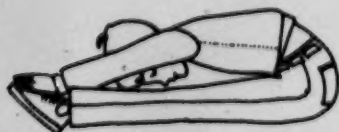
STRETCHING EXERCISES

Technique Card

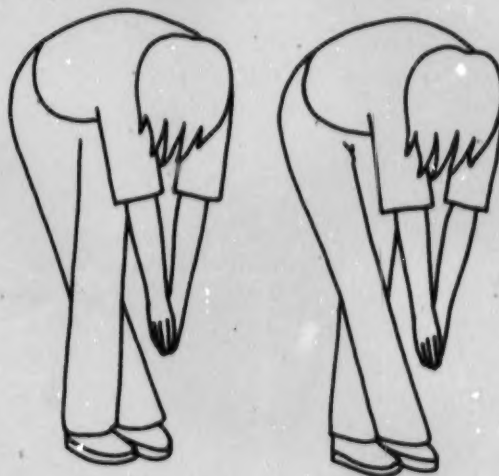
1. Stand about three feet from a wall. Face the wall. Keeping your knees straight and your heels on the floor, bring your arms forward and place the palms of your hands against the wall. Bend your arms at the elbows and lean into the wall for 30 seconds.



2. Sit on the floor with your legs together and straightened out. Reach for your toes for 30 seconds.

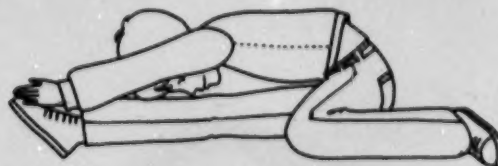


3. Stand up and cross your legs. Bend over, and reach for the floor. Do not bend your knees. Hold this position for 30 seconds.



4. Switch the positions of your legs and repeat Exercise 3.

5. Sit on the floor with one leg straightened out and the other bent to the side. Reach for the toes on your straight leg for 30 seconds.



6. Switch the positions of your legs and repeat Exercise 5.



**Blindfolded Traveler
Limber Up
Size and Age
The Way We Grow**

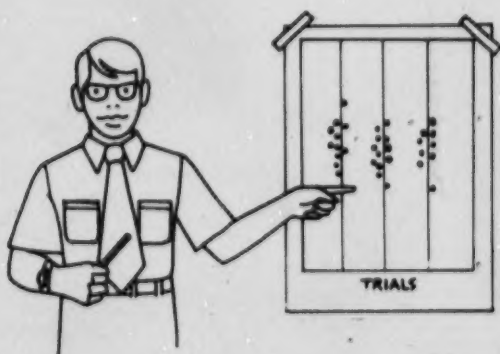
AVERAGING METHOD

Technique Card

This averaging technique eliminates the necessity of calculating an arithmetical average. Instead, this technique helps you locate a point that the class thinks best represents all the dots in one column (or row) of data.

To get this average:

1. Point out the highest and lowest dots in a column (or the two end dots in a row, if your data run horizontally), so that the students are aware of the entire range.
2. Place your finger at the top dot in the column (or at the last dot in a row).
3. Look at the class. *Do not look at the chart.*



4. Tell the students to raise their hands when your finger reaches the point that best represents all the dots (the middle or average).

5. Move your finger slowly down the column (or back across the row). You will have to move your finger down the entire length of the column (or along the entire row of dots) to make sure that you don't stop at a point where a lot of hands are raised and miss a point further down (or back) where more hands might be raised. Then move your finger back to the area where a lot of hands were raised. Move your finger slowly up and down (or back and forth) around that area to find the precise point where the most hands are raised.

6. Mark that point with an X. Follow this procedure for each column (or row) of dots. Connect the X's with a felt-pen line.

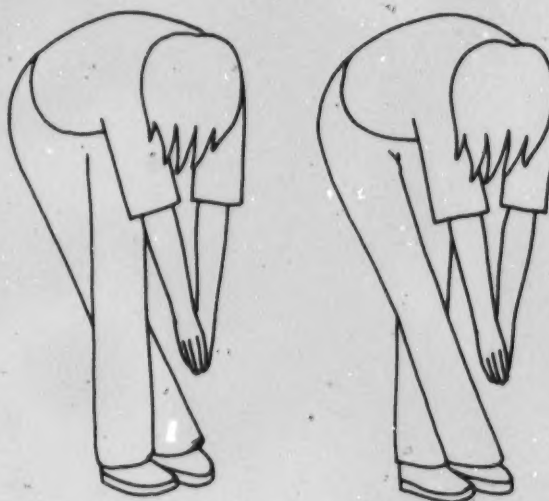
2. Invite the students to help you plan an experiment to find out if doing stretching exercises can help them to bend over farther. Through discussion, establish the need for a control group (a group that doesn't exercise) to compare with those who do the exercises. For example, if we were to compare everyone's stretches after exercise to their stretches before exercise, most everyone would have done better after exercising. But we wouldn't know if they did better because they tried harder or because the first stretch warmed them up. By having half of the class exercise and half not exercise, a difference between the results of the exercisers and non-exercisers could safely be attributed to the exercise.

3. Explain to the students that after the exercise, all the students will again measure their fingertip-to-floor distances. In this way the students can discover if there is a difference between the performances of the exercisers and the non-exercisers.

Conducting the Stretching Experiment

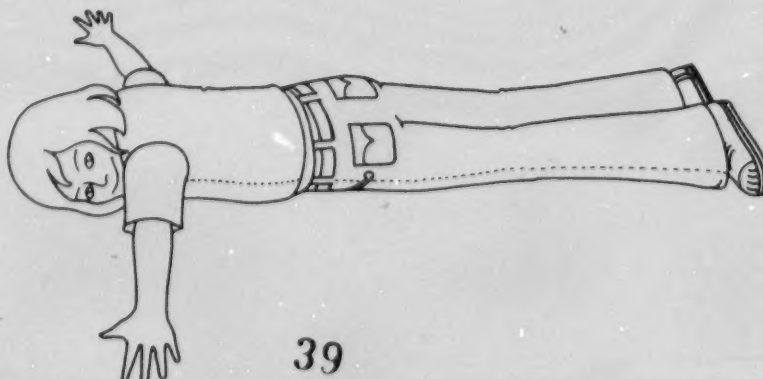
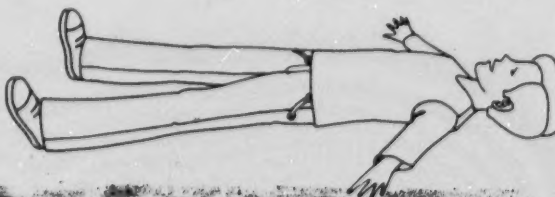
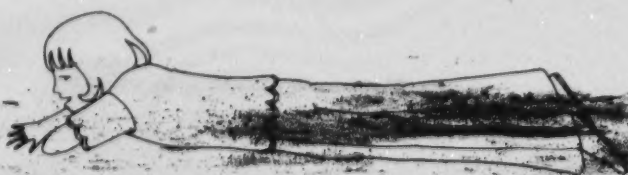
1. Have everyone draw a dot from the container.

2. Announce that the people with red dots will do the stretching exercises while the people with green dots will be non-exercisers (the control group).

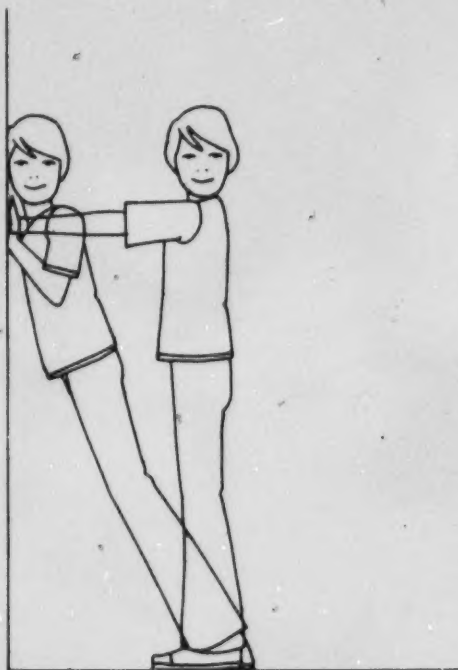


3. Have the non-exercisers lie on the floor and assume limp, relaxed positions.

4. Tell the exercise group that each of the exercises will stretch some of their muscles. Tell them to stretch so that they can feel a pulling sensation; they should not feel pain. After a few seconds, the pulling will ease, and they should then stretch farther. Stretching should always be slow and steady. Bobbing or bouncing could tear muscle or connective tissue.



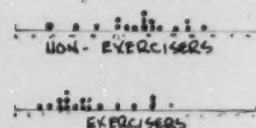
5. Lead the exercise group through the sequence of exercises on the "Stretching Exercises" Technique Card. The effects of stretching are short-lived, so proceed promptly from one exercise to the next. Encourage the children to stretch fully.



Collecting and Recording the Results

1. Immediately upon finishing the stretching exercises, partners pair up again and repeat the measurement made at the beginning of the activity. The students should stand on the same platform of books as before. Remind the students that they must be able to hold their position for three seconds, and caution them again about bouncing. Have the students record their measurements on scratch paper.
2. Each student places her colored dot on the class chart above the number that represents this last measurement. Non-exercisers use the top scale and exercisers use the bottom scale.

DISTANCE BETWEEN FLOOR
AND FINGERTIPS



Interpreting the Chart

1. Ask the students if the chart shows that stretching exercises made a difference in how close they could get their fingertips to the floor. What evidence can they point to on the chart to verify their conclusions?
2. If the chart doesn't show a clear difference between exercisers and non-exercisers, use the method described in steps 1-5 on the "Averaging Method" Technique Card to find the average second measurement for exercisers and for non-exercisers.

DISCUSSING THE RESULTS

1. What importance do our results have for people playing games and participating in other physical activities?
2. Name some activities for which you should warm up or do stretching exercises.
3. In what kinds of situations could you prevent problems by doing stretching warm-ups? Has anyone ever torn or pulled a muscle? What did that feel like?

ADDITIONAL CHALLENGE

Predict how long the effects of stretching exercises will last. Design and carry out an experiment to check your prediction.

UP AND AWAY

SYNOPSIS

The students determine the relationship between their heights and the distances they can jump vertically and horizontally.

HEALTH BACKGROUND

Most of the medical problems young people have result from accidents. Jumping, a skill required in many activities, sports, and emergency situations, often results in accidents. Jumping involves several components: muscle strength, coordination, timing, balance, take-off and landing surfaces, and obstacles. With so many factors involved, one can easily see how a "simple" act like jumping is ripe for errors in judgment which can result in accidents.

By learning about their jumping capabilities, the students may make fewer errors in judgment and thus decrease the possibility of accidents. As the students practice jumping, they may improve their performances, learn to take more safety precautions, and increase their self-esteem and

self-awareness. By discovering that jumping ability is independent of height, the students may realize that size does not determine one's performance abilities.

MATERIALS

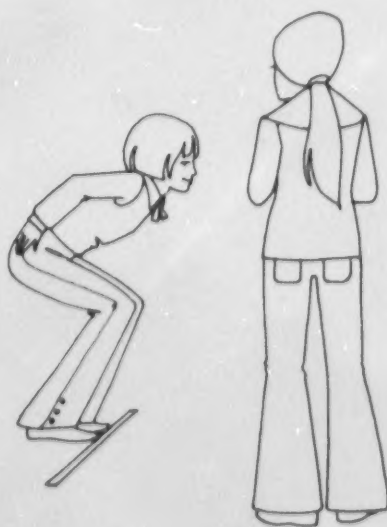
For each student:

- 1 copy of the Student Sheet*

For the class:

- 100 red dots
- 8 meter tapes
- 4 body-height scales
- 4 wall scales
- masking tape*
- dusty chalk or chalk dust*
- 1 "Do Tall People Jump the Highest and the Farthest?" class chart
- 1 "Measuring Body Size" Technique Card
- 4 hardbound books*
- 1 duplicator master of the Student Sheet, "Measuring Body Height and Jumping Distances"

*Provided by the teacher

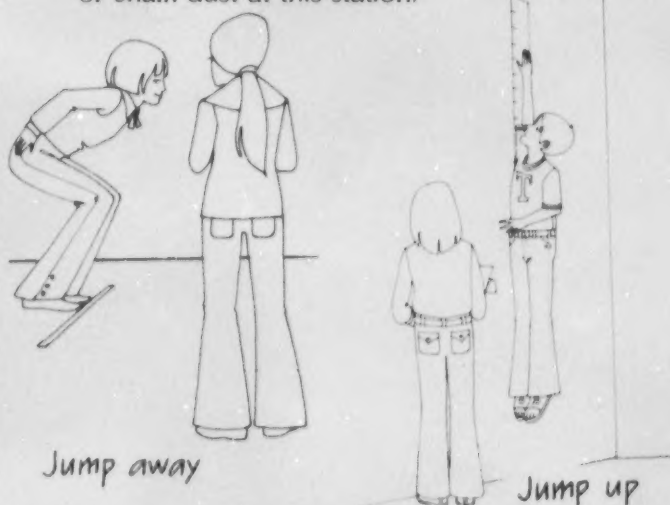


SETTING UP

Scheduling the Activity. This activity usually requires one forty- to fifty-minute class period.

Preparing for the Activity

1. Set up three measuring stations.
- a. **Jump-Up Station.** Post the four wall scales. Make sure that the 150-cm mark on each scale is exactly 150 cm from the floor. Use one scale as an instrument to measure the 150-cm distances from the floor at each location. (You may need to use a ladder in order to tape up the scales.) Place the chalk or chalk dust at this station.



- b. **Jump-Away Station.** Clear four sites either inside or outside the classroom. Each site should have at least a $2\frac{1}{2}\text{m} \times 2\text{m}$ area for jumping. Tape a 30-cm piece of masking tape on the floor at one end of each site to serve as a starting line. Make two meter tapes available at each site to be shared between the teams. (Some measurements will require the use of both meter tapes.)
- c. **Body-Height Station.** Tape four body-height scales about one meter apart on a blank wall. The 0-cm end of each scale must be flush with the floor. Place the books at this station.
2. Post the class chart and place the dots near the chart.
3. Make a copy of the Student Sheet for every student.

THE ACTIVITY

Introducing the Activity

1. Ask the students to offer some reasons why people want to or need to jump. In addition to the more common responses such as dodging cars and bicycles, encourage responses that relate to survival demands not normally encountered. Experiences related to escape from threatening people, animals, flash floods, avalanches, falling trees, and fire might be offered by the children.
2. Explain to the students that in this activity they will be measuring their body heights, how far they can jump, and how high they can jump. Then they will determine the relationship between the distances they can jump and their height.
3. Give each of the students a Student Sheet so they can see where they will record the measurements for each of the tasks about to be demonstrated.

Demonstrating the Jump Up

1. Gather the students at one of the wall scales. Explain to the students that for this jump they will measure how high off the ground they can jump.
2. Have a student stand with one side of his body next to a wall scale.
3. Have him rub chalk on the finger pads of his hand closest to the wall.
4. Tell him to keep his feet flat on the floor, reach as high as possible, and make a mark with his chalked fingers on the blue wall scale. Explain that this measurement will be recorded in item #2 (reach measurement) on the Student Sheet.
5. Have the student rechalk his fingers. Tell him to jump as high as possible and again slap his fingers on the scale, leaving a chalk mark. This measurement (jump measurement) will be recorded on the Student Sheet in item #1.
6. Explain to the students that they will subtract their reach measurement from their jump measurement. The result is the jump-up distance, i.e. how high they jumped.

UP AND AWAY

Student Sheet

Name _____

MEASURING BODY HEIGHT AND JUMPING DISTANCES

JUMP-UP DISTANCE

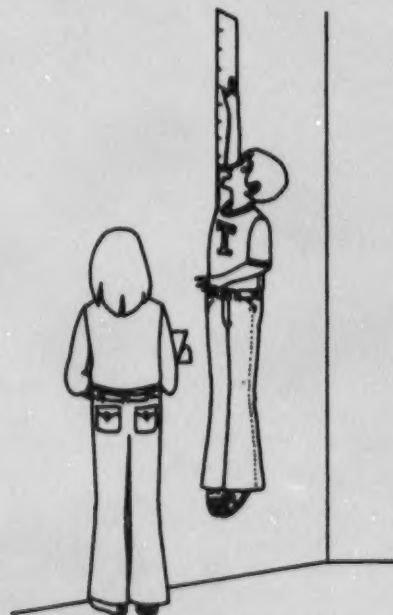
1. My jump measurement (the number I touched when I jumped) is: _____ cm
2. With my feet flat on the floor, my reach measurement is: _____ cm
(minus) _____ cm
3. When I subtract my reach measurement from my jump measurement,
I find that my **jump-up measurement** is: _____ cm

(My jump-up measurement is the number of centimeters I can jump off the ground.)

JUMP-AWAY DISTANCE

4. How far can I jump?

I can jump: _____ cm



BODY HEIGHT

5. I am: _____ cm tall

(Be sure to add 100 cm to the number you read off the meter tape.)

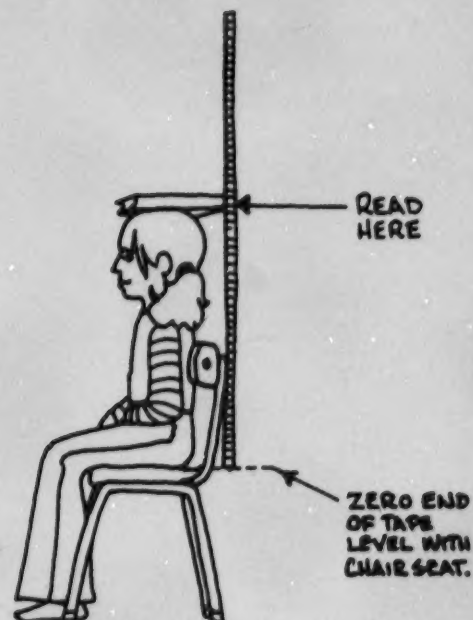
MEASURING BODY SIZE

Technique Card

Measuring Trunk Height

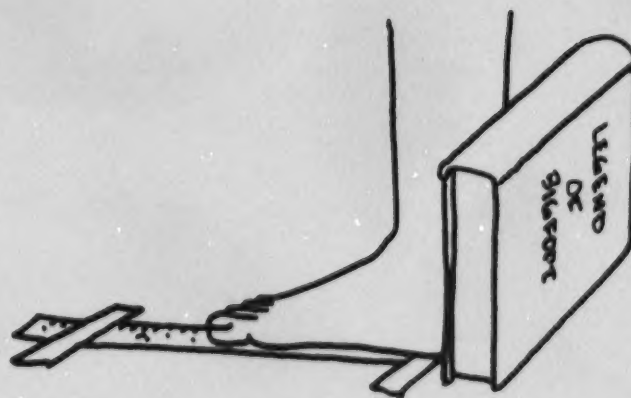
Trunk height is the distance from the buttocks to the top of the head.

1. The student being measured sits straight in the chair.
2. Place the book on her head. Make sure that the book is level.
3. Read the number where the bottom of the book touches the meter tape. This number is the student's trunk height in centimeters.



Measuring Foot Length

1. Hold a hardbound book upright on the floor. The front or back cover of the book should be flush with the 0-cm end of the ruler taped to the floor.
2. The student being measured removes one of her shoes and one of her socks, if necessary.
3. Have the student stand on the ruler with her heel against the book and her big toe centered on the ruler.
4. Read the number closest to the end of the big toe. This number is the student's foot length in centimeters.



Calculating Leg Length

To obtain the leg length, subtract the trunk height from the body height. The result of this subtraction is the student's leg length in centimeters.

***Equals
How Tall Will You Be?
Size and Age
The Way We Grow
Up and Away***

MEASURING BODY SIZE

Technique Card

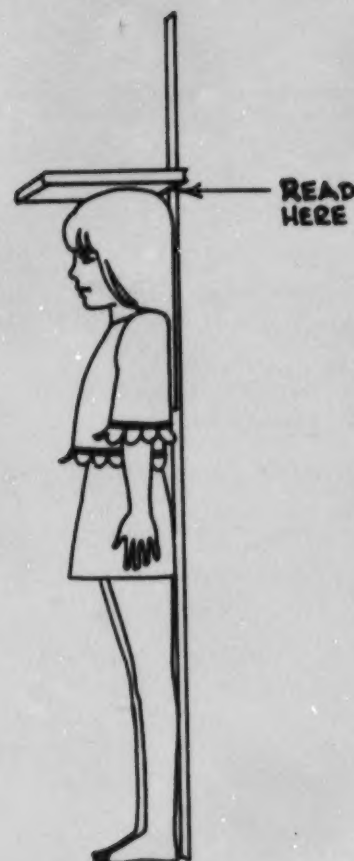
Measuring Body Height

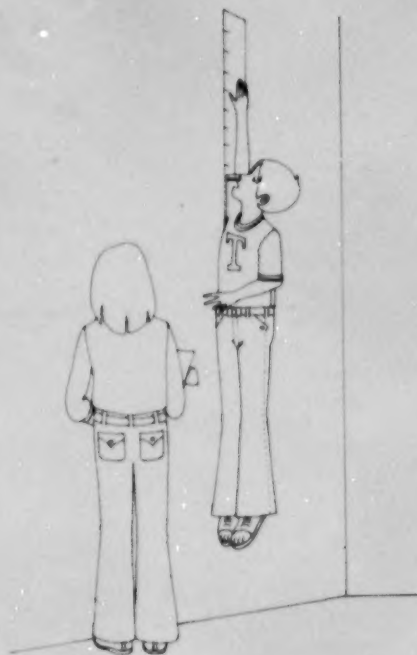
1. The student being measured takes off her shoes.
2. She stands with her back against the body-height scale.
3. Her heels, buttocks, and shoulders should touch the wall.
4. Make sure that she keeps her back as straight as possible.
5. Her feet should be flat on the floor and her heels close together.
6. Place the book on her head. Make sure that the book is level.
7. Read the number where the *bottom* of the book touches the body-height scale. This number is the student's height in centimeters.

Measuring Head Size

Head size is the distance around the upper part of the head.

1. Place the tape just above the student's eyebrows.
2. Hold the 0-cm end of the tape against the side of his head.
3. Wrap the tape snugly around the widest part of his head.
4. Read the tape number that meets the 0-cm end of the tape. This number is the student's head size in centimeters.





7. Using a moist paper towel, wipe the chalk marks off the wall scale. (You may still need the ladder in order to wipe off the marks.)

Demonstrating the Jump Away

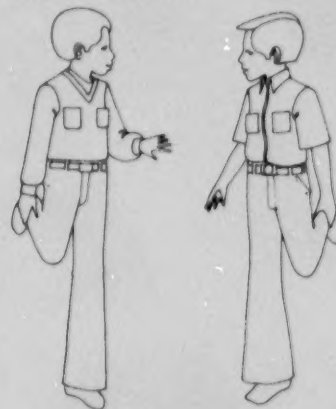
1. Gather the students at one of the jump-away sites. Explain to the students that they will measure how far they can jump from a standing position.
2. Have a student face the open space and stand behind one of the strips of masking tape with her toes at the edge of the tape.
3. Tell her to jump as far as she can. Mark her heel position with a pencil.
4. Explain to the students that the measurement is taken from the edge of the masking tape her toes were touching to the point at which her heels landed.
5. Measure that distance, and tell the students that this measurement is the jump-away distance, which will be recorded in item #4 on the Student Sheet.

Demonstrating How to Measure Body Height. See the **Measuring Body Height** section on the "Measuring Body Size" Technique Card for measuring instructions.

Conducting Warm-Up Exercises. To prevent injuries, lead the students in warm-up exercises before they make their jumps. Instruct the students to stretch slowly and steadily; *they should not jerk or bob.*

The Exercises

1. Stand on one foot. Hold your other foot in your hand and pull up on it gently for thirty seconds. Switch to the other foot and repeat the exercise for thirty seconds.



2. Sit on the floor with your legs together, straight in front of you. Reach for your toes with your hands. Hold this position for thirty seconds.

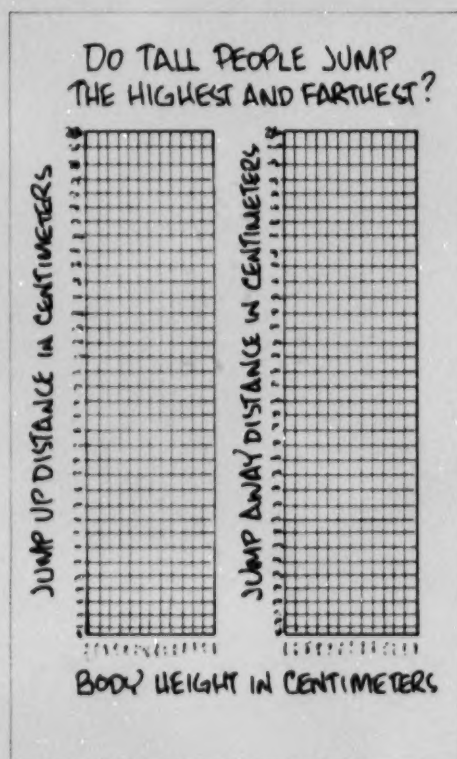


3. Jog in place for one minute.



Doing the Activity

1. Divide the class into pairs, and assign one-third of the teams to each station.
2. Partners should take turns at being the jumper and the measurer/recorder.
3. Allow the students two practices at each station before they make their test jumps, the results of which they will record on their Student Sheets.
4. After all the students have completed their tasks at their first stations, and had their measurements recorded, have the students place a red dot on the chart for each of their measurements.



5. Have the teams rotate through the three stations until all the measurements have been taken and recorded.

JUMPING TO CONCLUSIONS

After the students have collected their data, initiate a discussion of the results.

1. What were some of the surprising results? (Students usually jump much farther horizontally than they do vertically.)
2. Thinking about your body movement in each jump, how is jumping up different from jumping out? (Encourage the students to reenact their different body movements in answering this question.)
3. How does the height of a person affect the distance he or she can jump?
4. In what situations might the ability to jump up keep you out of danger? How might the ability to jump horizontally help you?
5. What kinds of things should you consider before jumping?

ADDITIONAL CHALLENGES

1. **Volunteer Jumping-Improvement Experiment.** Have one group of students practice the jump away and another group practice the jump up. After one week, retest both groups on both jumps. Did the students improve on both types of jumps or just the one they practiced?
2. Invite the P.E. teacher in to help the students work on efficient jumping.
3. Invite a younger or older class in to investigate the relationships of body height to jumping ability at other ages.

STIFF JOINTS

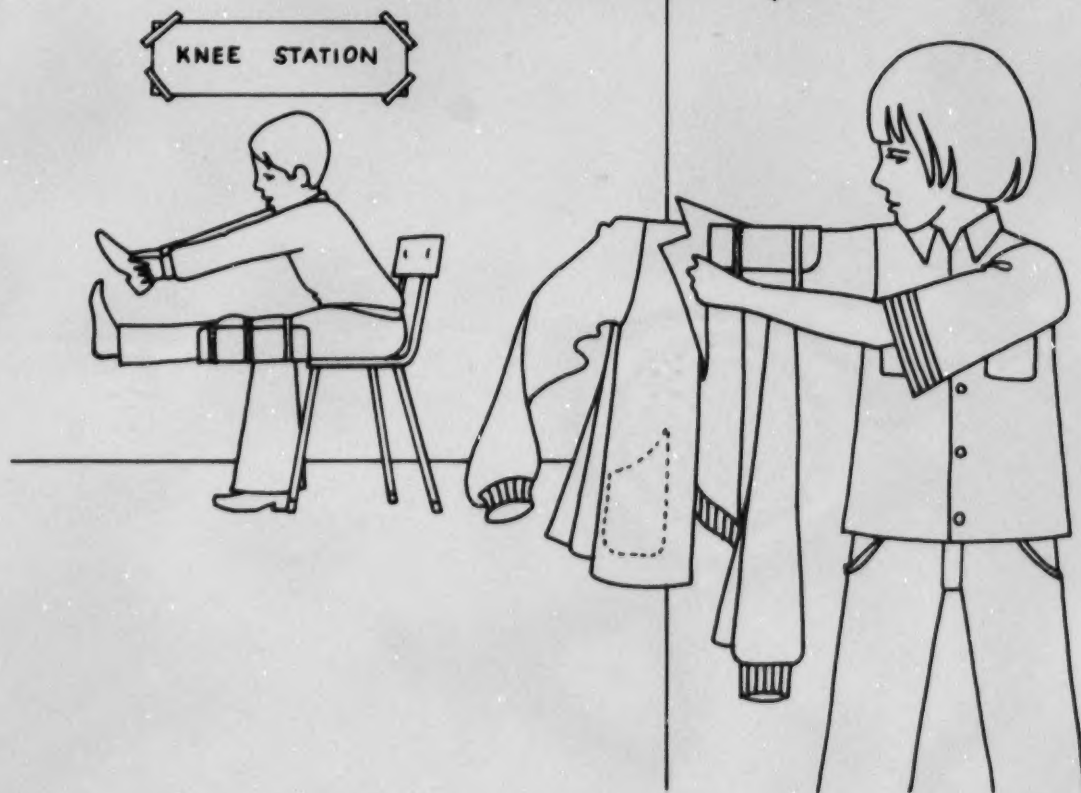
SYNOPSIS

By wearing splints on various joints while performing everyday tasks, the students discover that limited joint flexibility restricts freedom of movement and necessitates compensation.

HEALTH BACKGROUND

Everyday activities depend on the full range of joint movement. A joint is the point of contact between a bone and another bone or cartilage. Joints that are loosely held together allow for a greater range of movement, yet are more easily injured than rigid joints or joints with closely fitting bony parts, ligaments, or muscles.

U.S. health statistics indicate that joint impairment is relatively common. Joint injuries often result from home accidents, self-defense programs, and even physical-fitness programs. Joint mobility, poor coordination, muscular weakness, and bone atrophy are all interrelated factors that often work together to restrict freedom of movement, especially as people age. In this activity the students are encouraged to think about ways of protecting their joints and maintaining their joint flexibility.



MATERIALS

For each student:

- 1 copy each of Student Sheets 1-4*
- 1 comb*

For the class:

- 10 small splints
- 5 large splints
- 3 strap extenders
- 1 "Putting on the Splints" Technique Card
- 2 large pairs of gym shorts, cutoffs, or swim trunks*
- 2 coats*
- 1 wastebasket*
- 6 pencils*
- 2 chairs*
- chalk and erasers*
- 2 wadded pieces of paper*
- 2 long pieces of thread*
- 2 needles*
- 1 duplicator master each of Student Sheet 1, "Knee Tasks," Student Sheet 2, "Hand-and-Wrist Tasks," Student Sheet 3, "Elbow Tasks, and Student Sheet 4, "Telling Stories"

*Provided by the teacher and students

SETTING UP

Scheduling the Activity. Allow one to two class periods for this activity.

Preparing for the Activity

1. Advise the students the day before the activity that they will be finding out how restricting their joint movement affects their ability to perform everyday tasks. Ask the students (a) to wear shoes with laces, or sandals with buckles, (b) to wear pants and long-sleeved shirts to protect their knees and arms from chafing by the splints, and (c) to bring combs to class.

Also make sure that at least two students bring large coats.

2. Make a copy of each Student Sheet for every student.
3. Set up the following three stations in the classroom:

- a. **Knee Station:** two chairs, two pairs of gym shorts.
- b. **Hand-and-Wrist Station:** six pencils, two wadded pieces of paper, two long pieces of thread, two needles, one wastebasket.
- c. **Elbow Station:** a chalkboard, chalk, erasers, two coats. Each student will need his or her comb at this station. Write the following headings at the top of the chalkboard: NO SPLINT, ELBOW SPLINT. (The students will be writing their names with their elbows splinted and unsplinted.)

THE ACTIVITY

Introducing the Activity. Ask the students some questions about joints. "What and where are joints? What do they do? If you couldn't move some of your joints, how would your life change?" Explain to the students that they are going to restrict their joint movement and perform some everyday tasks to find out how such restrictions affect their ability to function.

Moving Without Splints. Tell the students that first they are going to perform, with unrestricted joint movement, some everyday tasks. The tasks are listed on the student sheets.

1. Distribute copies of Student Sheets 1-4 to each student.
2. Assign partners and divide the class into three groups.
3. Point out the three stations and the chalkboard headings. Assign each group to start at a different station. Explain each station's tasks, and tell the students to do all of the tasks at their first station, and then to move on to the next stations until they have completed all the tasks (knee, elbow, hand-and-wrist) without wearing splints. (Splints should not be available at this time.)

STIFF JOINTS

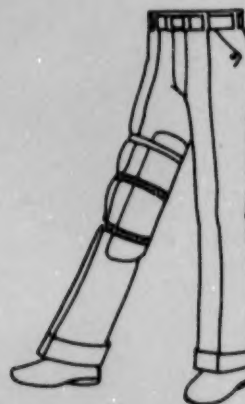
Student Sheet 1

Name _____

KNEE TASKS

1. **Without Splints.** Do each of the three **KNEE TASKS** without wearing a splint.

2. **With Splints.** Have your partner help you put one of the large splints on your knee. Put the plastic part behind your knee and the middle strap above your kneecap. Do each task without bending your splinted knee.



KNEE TASKS: How difficult is each task when you are wearing a splint? Make a check in the appropriate box.

	Easy as without splints	Harder	Almost impossible
Task 1 Sit down in a chair and then get up again. Use both legs.			
Task 2 Untie your shoe laces or undo sandal buckles. Take off your shoes. Put your shoes back on and tie or buckle your shoes.			
Task 3 Put on a pair of gym shorts and take them off again. a. Do it once by putting your splinted leg in first. b. Do it once by putting your free leg in first.			

3. Compensation

- When you did the tasks while wearing a splint, did you have to change the way you moved?
- If the splints did change the way you moved, then describe these movements.
- Why are these called compensating movements?

STIFF JOINTS

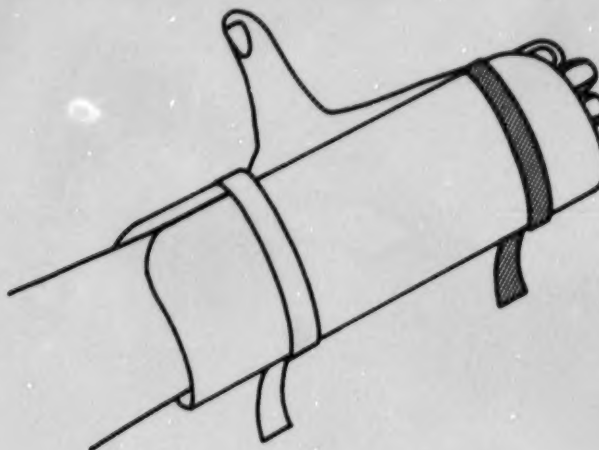
Student Sheet 2

Name _____

HAND-AND-WRIST TASKS

1. **Without Splints.** Do each of the three **HAND-AND-WRIST TASKS** without wearing a splint.

2. **With Splints.** Have your partner help you put one of the small splints around your writing hand. Two of the straps should be between the thumb and index finger.



HAND-AND-WRIST TASKS: How difficult is each task when you are wearing a splint?
Make a check in the appropriate box.

	Easy as without splints	Harder	Almost impossible
Task 1 Write your name on this piece of paper. Use your splinted hand and wrist only.			
Task 2 Throw a wad of paper overhand into a wastebasket two meters away. Use your splinted hand and wrist only.			
Task 3 Thread a needle. Use both hands.			

3. Compensation

- When you did the tasks while wearing a splint, did you have to change the way you moved?
- If the splints did change the way you moved, then describe these movements.
- Why are these called compensating movements?

STIFF JOINTS

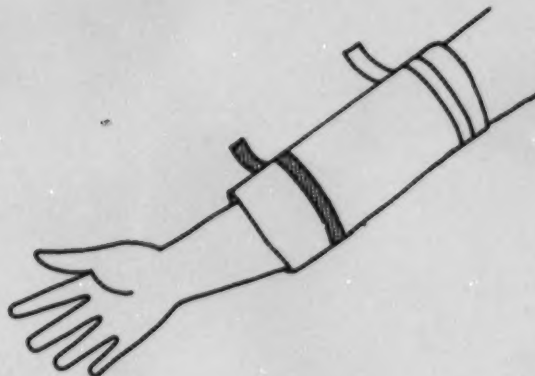
Student Sheet 3

Name _____

ELBOW TASKS

1. **Without Splints.** Do each of the three **ELBOW TASKS** without wearing a splint.

2. **With Splints.** Have your partner help you splint your writing arm where your arm bends. Be sure the plastic part is on the *inside* of your elbow. Do each task without bending your splinted elbow.



ELBOW TASKS: How difficult is each task when you are wearing a splint? Make a check in the appropriate box.

	Easy as without splints	Harder	Almost impossible
Task 1 Scratch your head or comb your hair. Use your splinted arm.			
Task 2 Write your name on the chalkboard. Use your splinted arm.			
Task 3 Put on and take off a coat. a. Do it once by putting your splinted arm in first.			
b. Do it once by putting your free arm in first.			

3. Compensation

- When you did the tasks while wearing a splint, did you have to change the way you moved?
- If the splints did change the way you moved, then describe these movements.
- Why are these called compensating movements?

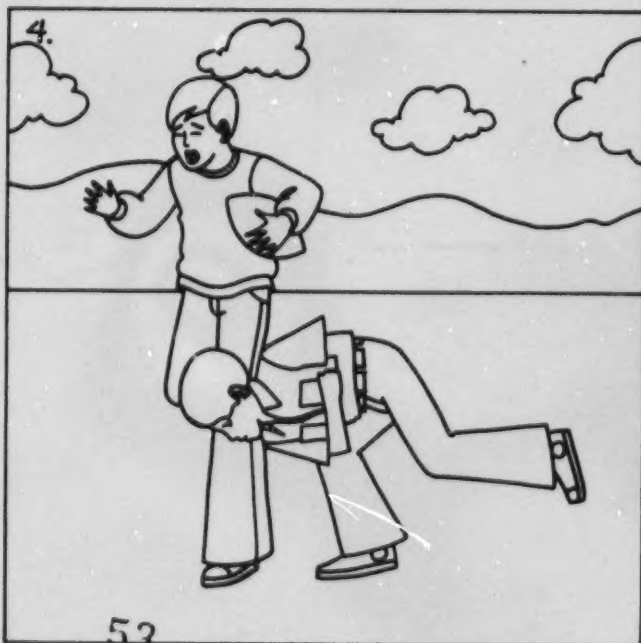
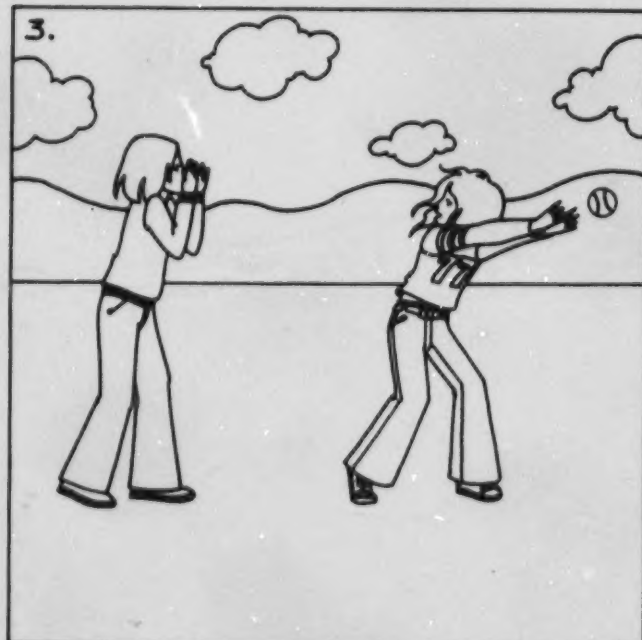
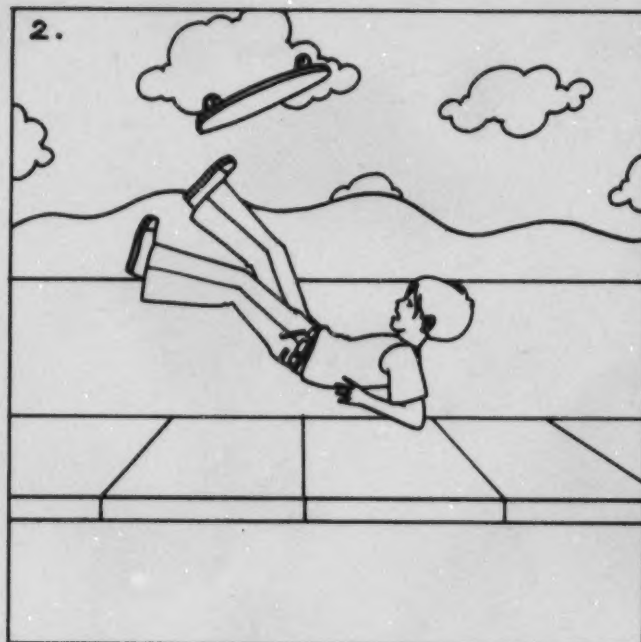
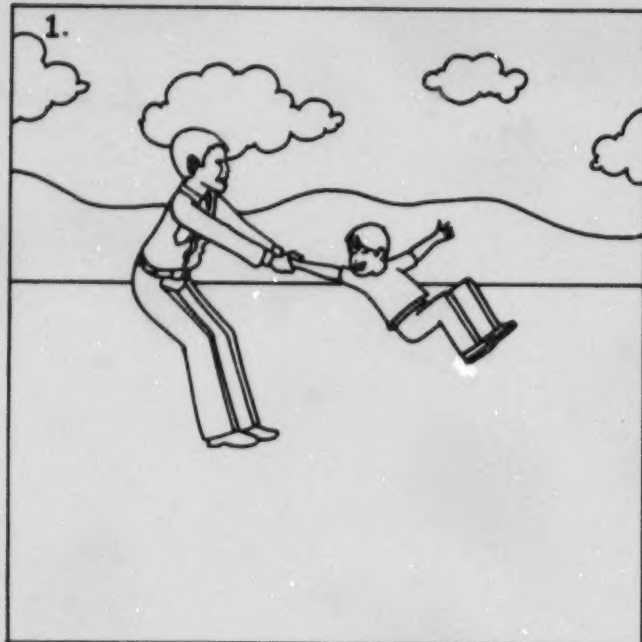
STIFF JOINTS

Student Sheet 4

Name _____

TELLING STORIES

Tell a story about each of these cartoons.
Which joint might each person hurt?
How will it happen?
How could it be avoided?

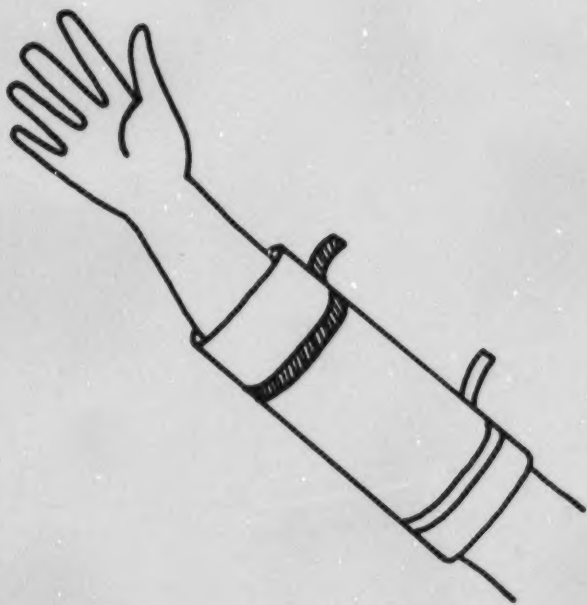


PUTTING ON THE SPLINTS

Technique Card

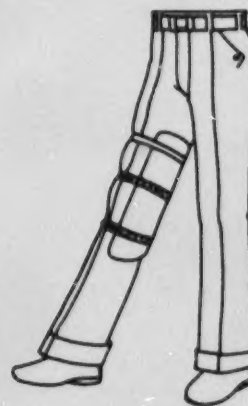
To Restrict Your Elbow

1. **Splint to use:** small splint with two straps.
2. Position the splint on the inside of the elbow joint.
3. First attach the green strap around your forearm. Then attach the white strap around your upper arm.
4. Make sure that the splint is centered over your elbow.



To Restrict Your Knee

1. **Splint to use:** large splint with three straps.
2. Position the splint on the inside of the knee joint.
3. First attach the middle green strap so that it is just above the kneecap. Then attach the white strap around the upper leg and the other green strap around the lower leg.



Splint Relay Stiff Joints

PUTTING ON THE SPLINTS

Technique Card

GENERAL PROCEDURE

The students work in pairs to position and secure the splints.

To Apply a Splint

1. Place the splint against the joint to be restricted. The white strap should always be closest to the heart, i.e. around the upper arm (elbow restriction), forearm (hand-and-wrist restriction), or thigh (knee restriction.)
2. Securely wrap each strap around the outside of the splint. Press the end of the strap against the hook patch on the splint. Always attach the strap that has two rivets on the hook patch first.
3. The splint must fit snugly enough for movement to be effectively restricted, but not so tight as to cause pain.
4. Strap extenders may be used to increase the capacity of the splint. Attach the hook patch of the extender strap to the pile (carpet-like) side of the splint strap.

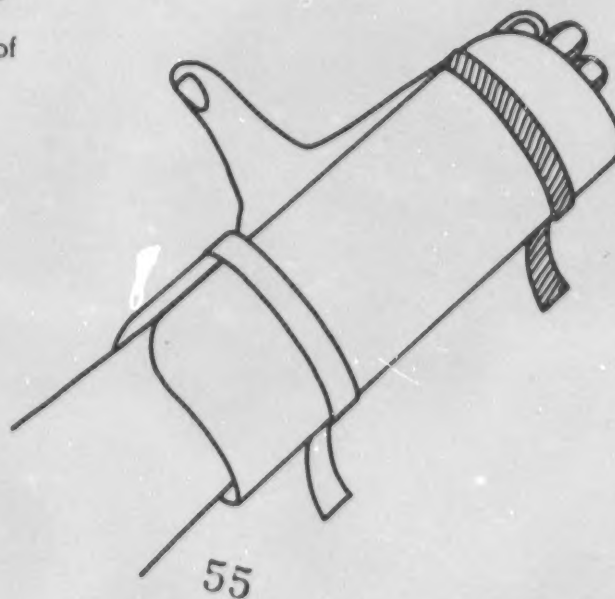
To Remove a Splint

Gently peel each strap off its hook patch.

RESTRICTING YOUR JOINTS

To Restrict Your Hand and Wrist

1. **Splint to use:** small splint with two straps.
2. With the help of your partner, position the plastic around your fingers and wrist as shown. The hand should be cradled in the splint with the thumb sticking out of the top.
3. First attach the green strap around your hand between your thumb and index finger. Then attach the white strap around your forearm.
4. Position the splint so that the middle fingernail projects just beyond the edge of the splint.

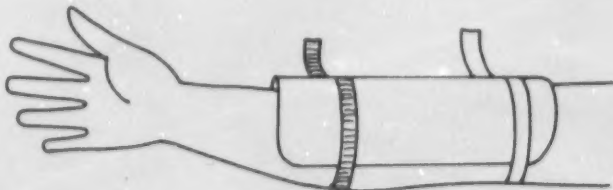


Introducing the Splints and the Rating

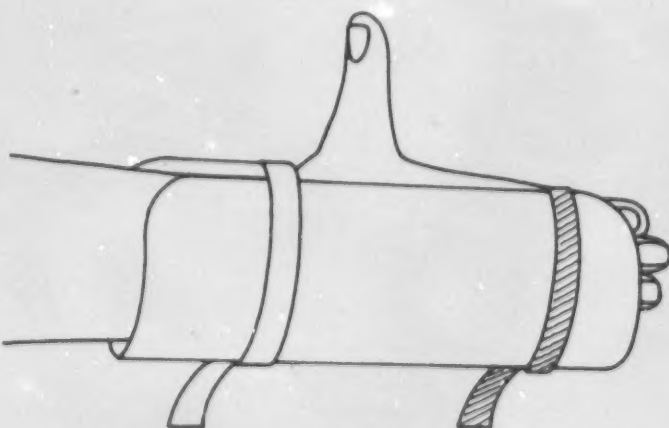
Procedure. After the students have completed the tasks, have them sit down. Explain that they are now going to do the same tasks but while wearing splints. As they complete each task, they will rate the difficulty of completing the task while wearing a splint as compared to completing the task while not wearing the splint. Tasks may be easier, harder (more time or effort), or impossible to do with splinted joints. (If a student can't complete a task within two minutes, the task should be rated as impossible.)

Demonstrating the Use of the Splints

1. Ask for a volunteer and show the students how to attach the splints to each joint. (See the "Putting on the Splints" Technique Card.) Splints should be secure but not so tight as to cause pain.

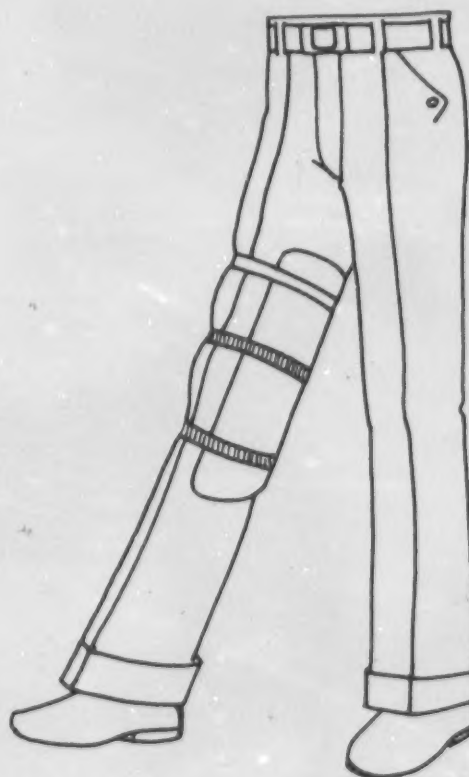


2. Have the volunteer do one part of KNEE TASK 3 (from Student Sheet 1) first without and then with the splint. Ask the students to describe any new kinds of movements the volunteer made with the splint on.



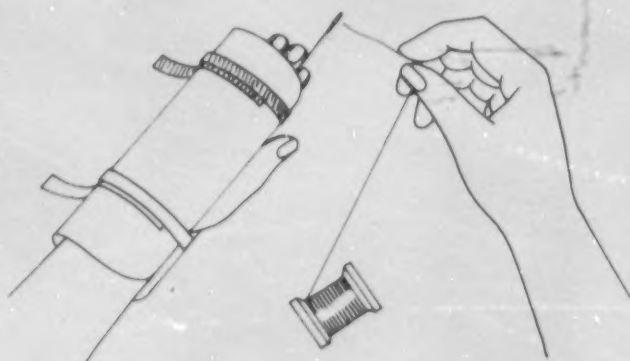
3. Introduce the idea of compensatory movements to the students by explaining that the volunteer had to compensate (make adjustments) for restricted joint movement.

4. How would the students rate the task? (You may have to tell the students to rate the tasks according to how much time and effort they take, *not* merely on whether or not they are successfully completed.)



Moving With Splints. Ask the three groups to go back to their starting stations. Explain the procedure, and then place the appropriate splints at each station.

1. One partner helps the other put on a splint. Each Student Sheet illustrates the proper positioning of the appropriate splint.
2. The splinted partner goes through all the tasks at each station while his partner notes compensatory movements and records ratings. (Some students may wish to redo a task without splints in order to make comparisons easier.)
3. The partners switch roles and repeat the procedure.



4. The pair moves to another station and repeats steps 1-3 until all the tasks at each station are completed.
5. As the students perform, move around the groups to make sure the splints are properly attached.

DISCUSSING THE RESULTS

1. How did you feel while you were wearing the splints?
2. Which tasks were the hardest to perform with splints? Why?
3. Did you change the way you performed a task (compensate) when you put on a splint? (Call on a few volunteers to demonstrate how they compensated.)
4. Have you or someone you know hurt a joint recently? How did you know the joint was injured? How could the injury have been avoided?
5. What things do people commonly do that could hurt their joints?
6. Has anything happened to the joints of some elderly people you know? Do you know someone who has arthritis, rheumatism, or gout? How do these diseases affect movement?
7. How can you protect your joints? (Do warm-ups, exercise regularly, or wear protective clothing or guards.)

ADDITIONAL CHALLENGES

1. Write or tell stories about the cartoons on Student Sheet 4. Which joint might get hurt? How could the injury be avoided?
2. Think of some everyday activities and do them. Predict how wearing a splint or a combination of splints might affect your performance. Try these tasks with splints on.

SPLINT RELAY

SYNOPSIS

The students devise ways of compensating for the limited mobility caused by splinted joints.

HEALTH BACKGROUND

Limitation of mobility, a standard measure of ill health used by the U.S. National Center for Health Statistics, is defined as restriction in the ability to move about freely. Such limitation ranges from difficulty in getting around alone to confinement in bed. The Center estimated that in 1972, 6.5 million (about one out of every thirty-two) people in this country had limited mobility due to chronic (lasting for a long time) conditions.

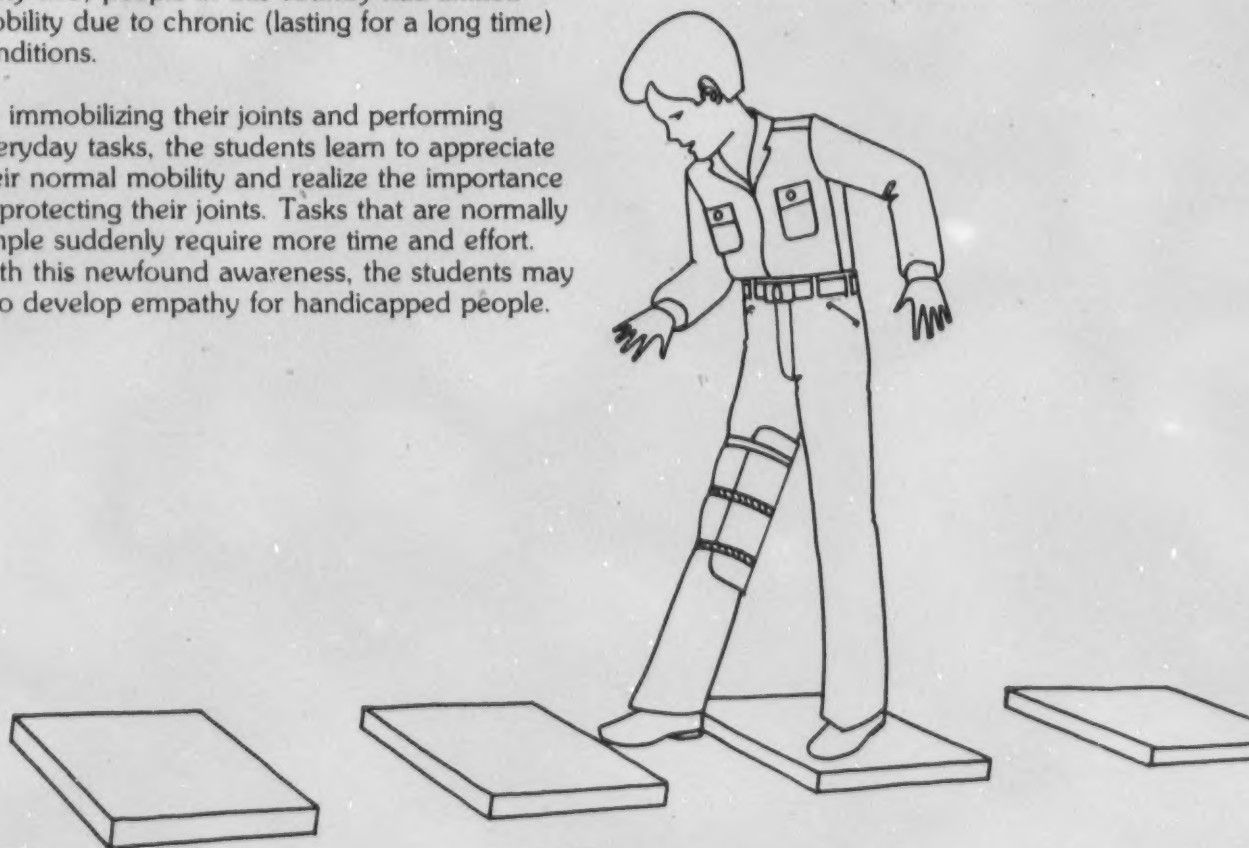
By immobilizing their joints and performing everyday tasks, the students learn to appreciate their normal mobility and realize the importance of protecting their joints. Tasks that are normally simple suddenly require more time and effort. With this newfound awareness, the students may also develop empathy for handicapped people.

MATERIALS

For the class:

- 5 large splints
- 10 small splints
- 1 "Putting on the Splints" Technique Card
- 3 strap extenders
- 1 copy of the Record Sheet*
- chalk or masking tape*
- materials and props to complete the tasks chosen for the relays*
- (See **The Three Task Categories** section.)
- 1 duplicator master of the Record Sheet

*Provided by the teacher



SETTING UP

Scheduling the Activity. Demonstrating the use of the splints and selecting the relay tasks require a total of twenty to thirty minutes. Running the relays and discussing the results takes one fifty- to sixty-minute class period.

Preparing for the Activity

1. The day before the activity, tell the students to wear long-sleeved shirts or sweaters for the activity. Long sleeves will keep the splints from chafing the students' arms. Girls should wear slacks.
2. Select a game site either indoors (classroom, gym, cafeteria, hallway) or outdoors. An 8m x 12m area should be large enough for a class of thirty-two.



3. Make one copy of the Record Sheet.
4. Gather the equipment needed for the tasks, and bring it to the game area. Keep in mind that there will be four stations and that you will need four sets of task items. In most cases you will need only four of each item (ball, gym shorts, jacket). In some cases, such as the paper that is to be wadded, you will need four pieces for each student in the class.
5. On a chalkboard, make a chart like the one on the Record Sheet.

THE ACTIVITY

Introducing the Activity. Tell the students that they will be splinting various joints and participating in relay races. With the movement of their joints restricted, they will be looking for ways to **compensate** (adjust for their limited mobility).

Demonstrating How to Wear the Splints.

Choose a student to demonstrate the proper positioning of each splint. (See the "Putting on the Splints" Technique Card.) Make sure that each student has time to practice putting on the splints before starting the relays.

Selecting the Relay Tasks. Poll the students, asking them to: **CHOOSE ONE TASK FROM EACH OF THE THREE CATEGORIES.** This method of selection insures that all of the splinted joints will come into play. Select several students to demonstrate the tasks.

SPLINT RELAY

RECORD SHEET

Record the order in which the teams finish.

Team Name	Knee	Elbow	Hand and Wrist	None
TOTALS				

INSTRUCTIONS:

1. Make one copy of this sheet for each class.
2. Record the number (1,2,3,4) of the place in which each team finishes. The results of the first race might look like this:

Team	Knee	Elbow	Hand & Wrist	None
Badgers	2			
Lions				1
Pirates		3		
Hawks			4	

3. Make a large chart like the one at the top of this page on the chalkboard. Copy the data from the Record Sheet.
4. For Discussion: Use the data to determine which joint is most restrictive (highest total score) and least restrictive for the tasks in **Splint Relay**.
Your finished chart might look like this.

Team	Knee	Elbow	Hand & Wrist	None
Badgers	2	1	4	1
Lions	3	2	4	1
Pirates	3	3	4	1
Hawks	2	3	4	2
TOTALS	10	9	16	6

60

least
restricted
joint

most
restricted
joint

Splint Relay Stiff Joints

PUTTING ON THE SPLINTS

Technique Card

GENERAL PROCEDURE

The students work in pairs to position and secure the splints.

To Apply a Splint

1. Place the splint against the joint to be restricted. The white strap should always be closest to the heart, i.e. around the upper arm (elbow restriction), forearm (hand-and-wrist restriction), or thigh (knee restriction.)
2. Securely wrap each strap around the outside of the splint. Press the end of the strap against the hook patch on the splint. Always attach the strap that has two rivets on the hook patch first.
3. The splint must fit snugly enough for movement to be effectively restricted, but not so tight as to cause pain.
4. Strap extenders may be used to increase the capacity of the splint. Attach the hook patch of the extender strap to the pile (carpet-like) side of the splint strap.

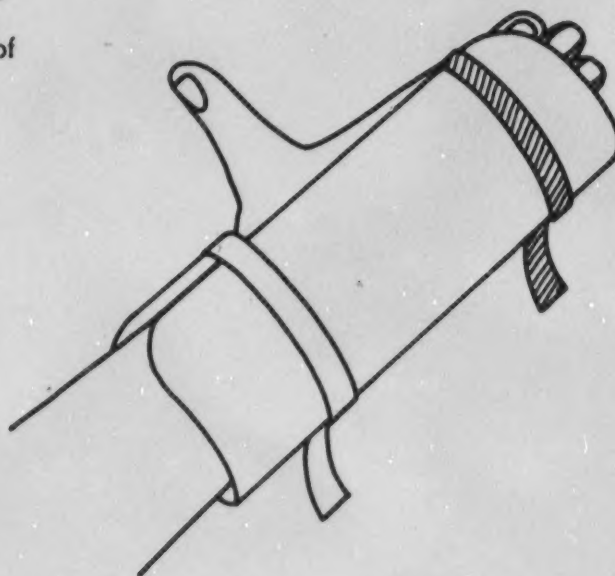
To Remove a Splint

Gently peel each strap off its hook patch.

RESTRICTING YOUR JOINTS

To Restrict Your Hand and Wrist

1. **Splint to use:** small splint with two straps.
2. With the help of your partner, position the plastic around your fingers and wrist as shown. The hand should be cradled in the splint with the thumb sticking out of the top.
3. First attach the green strap around your hand between your thumb and index finger. Then attach the white strap around your forearm.
4. Position the splint so that the middle fingernail projects just beyond the edge of the splint.

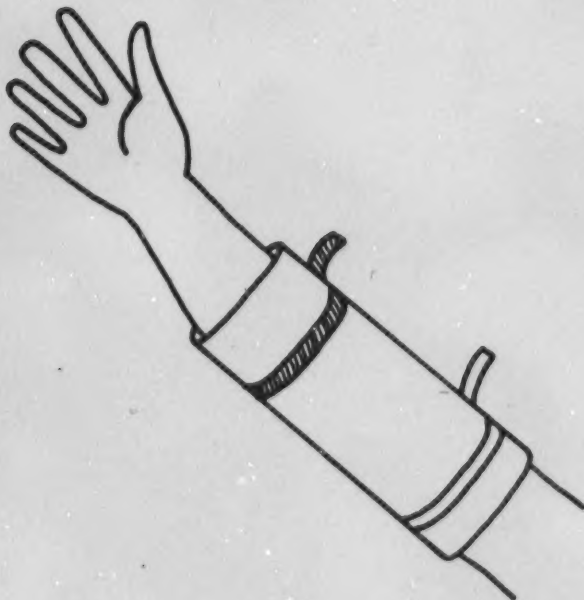


PUTTING ON THE SPLINTS

Technique Card

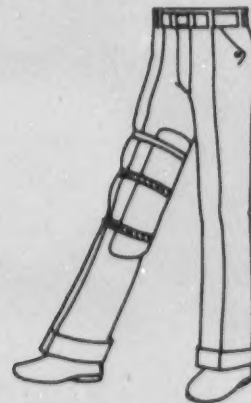
To Restrict Your Elbow

1. **Splint to use:** small splint with two straps.
2. Position the splint on the inside of the elbow joint.
3. First attach the green strap around your forearm. Then attach the white strap around your upper arm.
4. Make sure that the splint is centered over your elbow.



To Restrict Your Knee

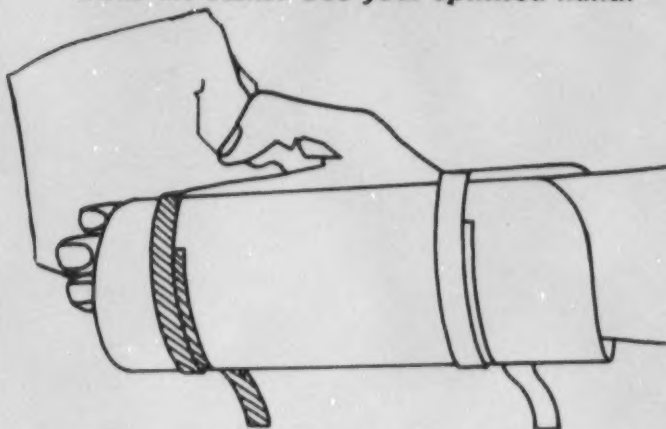
1. **Splint to use:** large splint with three straps.
2. Position the splint on the inside of the knee joint.
3. First attach the middle green strap so that it is just above the kneecap. Then attach the white strap around the upper leg and the other green strap around the lower leg.



The Three Task Categories

1. Hand-and-Wrist Tasks

- Standing one meter away from a wastebasket, wad a piece of paper, and toss it into the basket. **Use your splinted hand.**



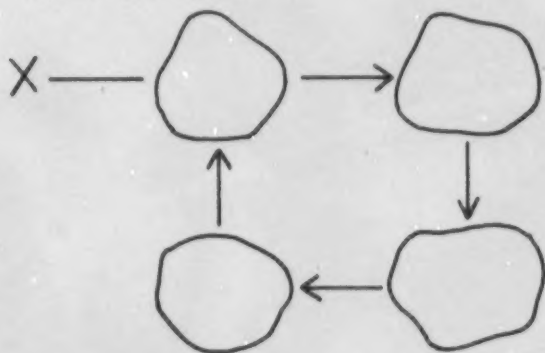
- Button and unbutton one button. **Use your splinted hand.**
- Put on a pair of safety goggles or a swim mask.

2. Elbow Tasks

- Put on and take off a large jacket or shirt.
- With a felt-tip pen and paper, write your name. **Use the hand of your splinted arm.**
- Bounce and catch a ball three times. **Use the hand of your splinted arm.**

3. Knee Tasks

- Put on and take off the large pair of gym shorts (or cutoffs or swimming trunks). **Put your nonsplinted leg in first.**
- Walk over stepping stones. Mark four to six stepping stones (each two to three meters apart) with chalk.



- Sit down in a chair, then get up.

Predicting the Results. Ask the students to predict how they will compensate for the restricted movement of each joint (knee, wrist, and elbow) in these tasks. Have the students write their predictions on paper.

Conducting the Relays

- Have the students help you place the task materials at each station. Designate the starting line and the task areas.
- Divide the class into four equal teams, one team to each station. (Extra students may act as umpires.) Ask each team to choose a team name.
- For each relay, the team at Station One wears knee splints, the team at Station Two wears elbow splints, the team at Station Three wears hand-and-wrist splints, and the team at Station Four does not wear splints. A relay consists of every team member completing the three tasks while wearing the appropriate splint for that station. In successive relays, each team moves to the next station, leaving the splints behind. In this way, each team gets a chance to do the three tasks with each kind of splint and without a splint.
- The players on each team line up behind the starting line. The first five players in each line have splints on.
- At your signal, the first player in each line moves to the task area and completes the three tasks while facing his team. Upon completing the tasks, he returns and tags the next player in line. This player then repeats the procedure. Every player on the team must complete all three tasks. A player cannot begin until he has been tagged by the returning player.
- Because there are not enough splints for each member of the team to have one, a player who has finished his task should give his splint to the first player in line who does not have a splint.

7. Ask the waiting students to observe how other students **compensate** (make adjustments) for their splints. Challenge the team members to note the most unusual and most common ways of compensating.
8. The team that completes the tasks first wins the relay.
9. You will find it easier to determine the finishing order of the teams if you watch two teams and have an aide or student watch the other two. You and your assistant can signal each other by calling out "FIRST," "SECOND," "THIRD," and "FOURTH." Record the results of each race on the Record Sheet. Record the order in which each team finishes (1,2,3,4).

DISCUSSING THE RELAYS

Transfer the data from the Record Sheet to the chalkboard. You may wish to have your students write out the answers to these questions before you hold the discussion.

1. How did your predictions compare with your actual performance with each joint splinted?
2. What was the most unusual way of compensating you observed?
3. What was the most common way of compensating you observed?
4. What was it like not being able to move your hand and wrist, elbow, and knee?
5. How would the rest of your life change if you couldn't move one of these joints? What wouldn't you be able to do? What would you have to do differently?
6. What kinds of tasks would make the relay harder? Easier?

ADDITIONAL CHALLENGES

1. Wear splints during part of your normal classroom activities. How do they affect your ability to participate?
2. Wear splints on non-preferred joints. Is your mobility limited more or less than when your preferred joints are splinted?

EQUALS

SYNOPSIS

The students compare the size of different parts of their bodies and discover that some parts, in addition to the corresponding right and left sides of the body, have equal measurements.

HEALTH BACKGROUND

Although people vary considerably in height, weight, and body build, their overall body proportions are similar. With this society's emphasis on physical appearance, middle-school students often feel self-conscious about their bodies as they experience the rapid body changes that accompany adolescence.

Measuring different body parts and comparing their sizes introduce students to the concept of body proportions. By discovering that they share the same body proportions, regardless of height, the students gain an appreciation for the form of their bodies. Through discussion, the students consider how body proportions affect movement and behavior.

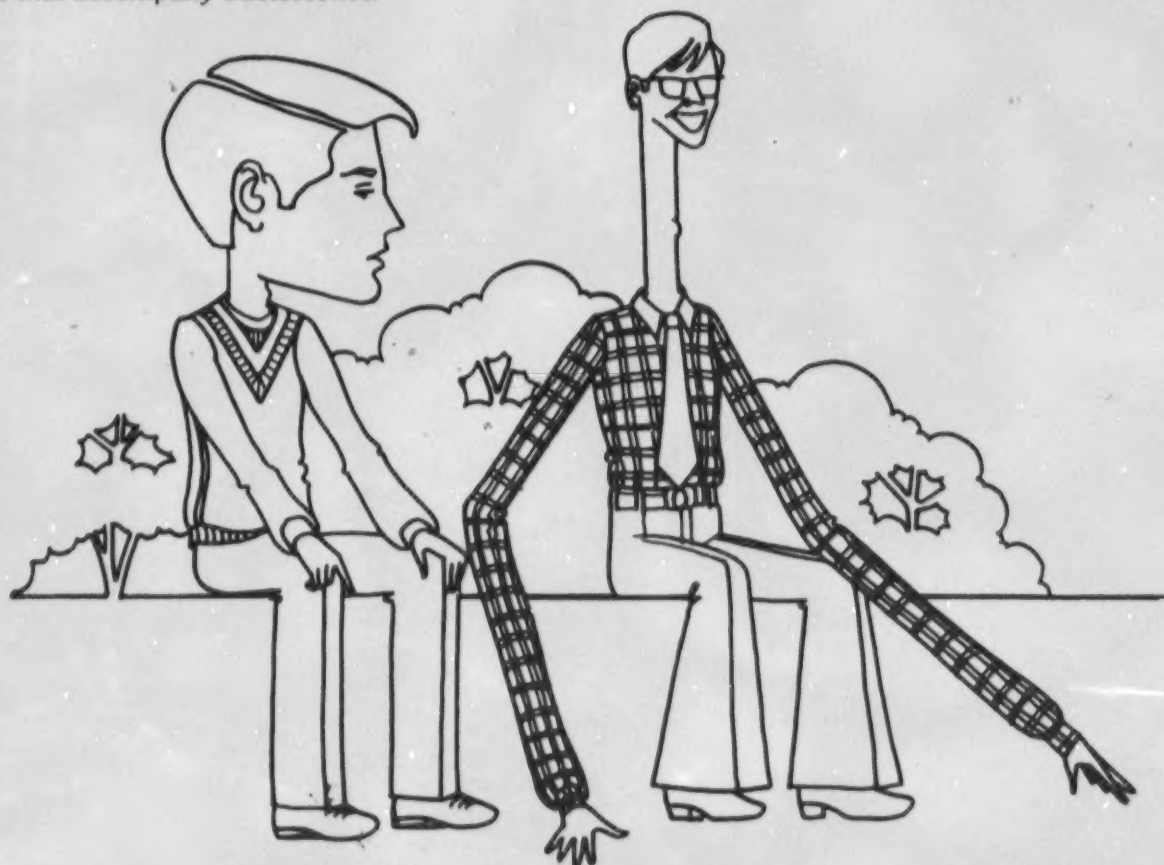
MATERIALS

For each student:

- 1 copy of the Student Sheet (two pages)*

For the class:

- 16 two-meter-long pieces of heavy string
- 4 body-height scales



- 4 hardbound books*
- 1 "Measuring Body Size" Technique Card
- 1 duplicator master of the Student Sheet, "Finding Equal Body Parts" (page 1 and page 2)

*Provided by the teacher

SETTING UP

Scheduling the Activity. *Equals* is a good introduction to the body-measurement activities (*Size and Age*, *The Way We Grow*, and *How Tall Will You Be?*), which deal with growth. This activity takes about thirty minutes.

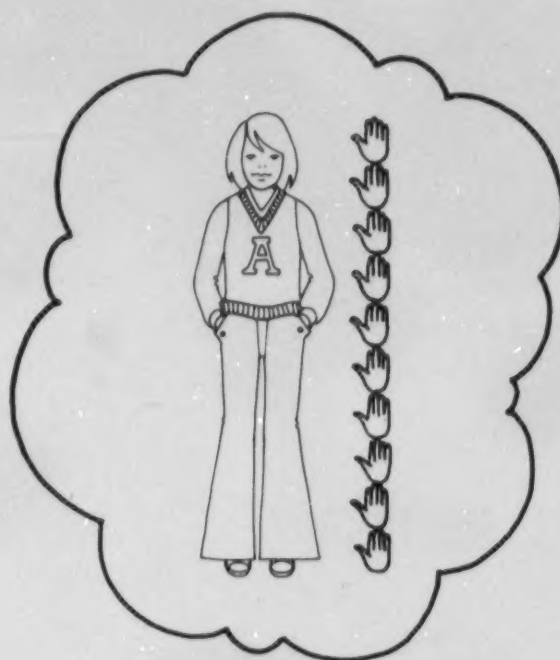
Preparing for the Activity

1. At four places in the room, set out a hardbound book and fasten a body-height scale to the wall, with the 0-cm end of the scale flush with the floor.
2. Make a copy of each of the two pages of the Student Sheet for every student.

THE ACTIVITY

Introducing the Activity

1. Ask the students if they can think of two parts of their bodies that are the same size. Someone will probably say that his left hand is the same size as his right hand. Ask the student: "We know your right hand and left hand are very close to the same size, but does your hand have the same measurement as any other part of your body?" This type of question encourages the students to think about size relationships between body parts that do not have the same structure or function.
2. Explain to the students that they are going to search for body parts that have the same measurement. Explain that measurements do not have to be *exactly* the same but they should be close, e.g. for small measurements like the hand or nose, within .5 cm, and for larger measurements like a leg, within 1 cm.



3. Challenge the students to find a body part that has a measurement equal to the distance around the fist.
4. With a volunteer, show the students how to take the fist measurement. Ask the volunteer to make a fist with her thumb outside her fingers. Pull the string taut around her fist, making sure the string goes across the knuckles.



EQUALS

Student Sheet, Part 1

Name _____

FINDING EQUAL BODY PARTS

1. What body part has the same measurement as the distance around your fist?

My _____



2. Does your bare foot "fit" between the inside of your elbow and your wrist?

Circle one: **YES** **NO**

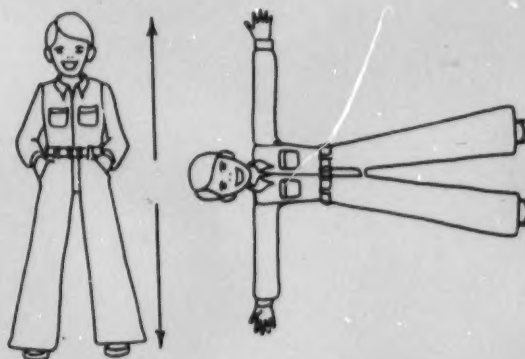
If no, is your foot bigger or smaller than your forearm? _____



3. Measure your height with the string. Now, with your arms straight out to your sides, measure your arm span. Does your arm span equal your height?

Circle one: **YES** **NO**

If no, which is bigger, your height or your arm span? _____



4. With the string, measure from the top of one ear, across the top of your head, to the top of the other ear. Is that distance the same as from the top of one ear, then under your chin, to the top of your other ear?

Circle one: **YES** **NO**

If no, which measurement is bigger, the over-the-head or the under-the-head measurement? _____



EQUALS

Student Sheet, Part 2

Name _____

FINDING EQUAL BODY PARTS

5. Measure your height with the string. Now how many times can you wrap that string length around your head?

Circle one: 1 2 3 4 5



6. Your height = _____ cm

The distance from your belly button to the floor = _____ cm

Divide your body height (the larger number) into the belly-button distance from the floor (the small number)

$$\frac{\text{belly-button distance}}{\text{body height}} = \frac{\text{cm}}{\text{cm}} =$$

or,

multiply the belly-button distance by 100 and divide by the body height.

$$\frac{\text{belly-button distance} \times 100}{\text{body height}} = \text{ \% }$$

7. Match equal body measurements by drawing a line between them. You should be able to find 4 "equal" pairs.

wrist circumference
chest circumference
nose length
ankle circumference
neck circumference
shoulder width
arm length

little-finger length
knee to ankle
open-mouth width
head circumference
hip circumference
ear length
foot length

8. Find and list some other body parts that have equal measurements or that are related in an interesting way.

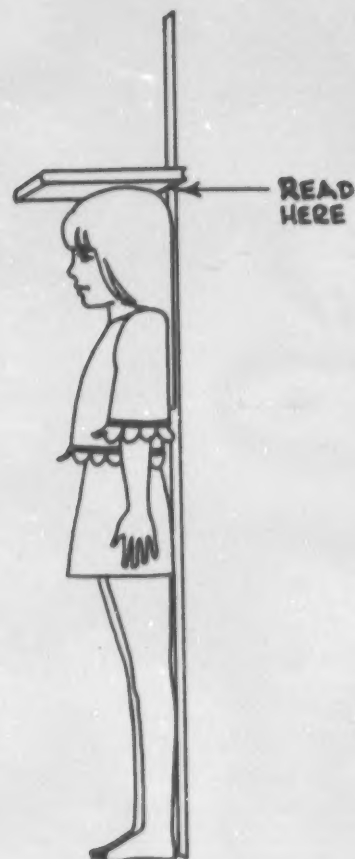
***Equals
How Tall Will You Be?
Size and Age
The Way We Grow
Up and Away***

MEASURING BODY SIZE

Technique Card

Measuring Body Height

1. The student being measured takes off her shoes.
2. She stands with her back against the body-height scale.
3. Her heels, buttocks, and shoulders should touch the wall.
4. Make sure that she keeps her back as straight as possible.
5. Her feet should be flat on the floor and her heels close together.
6. Place the book on her head. Make sure that the book is level.
7. Read the number where the *bottom* of the book touches the body-height scale. This number is the student's height in centimeters.



Measuring Head Size

Head size is the distance around the upper part of the head.

1. Place the tape just above the student's eyebrows.
2. Hold the 0-cm end of the tape against the side of his head.
3. Wrap the tape snugly around the widest part of his head.
4. Read the tape number that meets the 0-cm end of the tape. This number is the student's head size in centimeters.



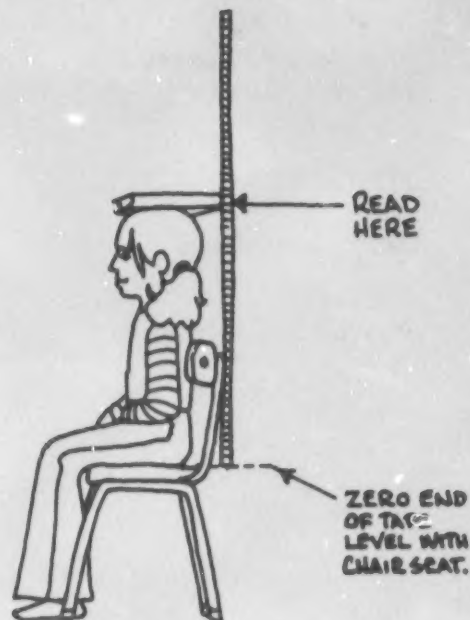
MEASURING BODY SIZE

Technique Card

Measuring Trunk Height

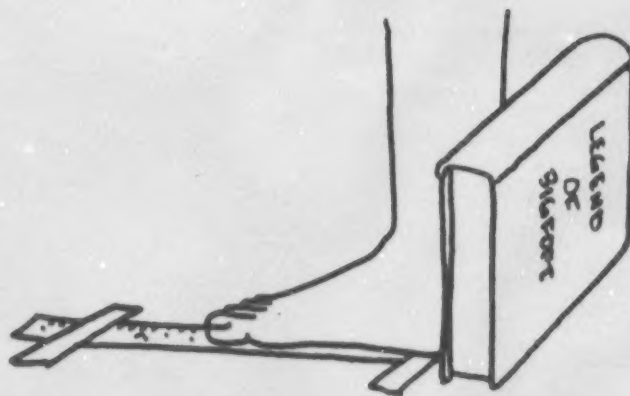
Trunk height is the distance from the buttocks to the top of the head.

1. The student being measured sits straight in the chair.
2. Place the book on her head. Make sure that the book is level.
3. Read the number where the *bottom* of the book touches the meter tape. This number is the student's trunk height in centimeters.



Measuring Foot Length

1. Hold a hardbound book upright on the floor. The front or back cover of the book should be flush with the 0-cm end of the ruler taped to the floor.
2. The student being measured removes one of her shoes and one of her socks, if necessary.
3. Have the student stand on the ruler with her heel against the book and her big toe centered on the ruler.
4. Read the number closest to the end of the big toe. This number is the student's foot length in centimeters.



Calculating Leg Length

To obtain the leg length, subtract the trunk height from the body height. The result of this subtraction is the student's leg length in centimeters.

5. Once you have the measurement, grasp the string with your thumb and forefinger at the point on the string that marks the distance around the fist. Tell the students that the distance between this point and the end of the string that just met this point is the distance they want to match with another body-part measurement. Tell the students that they will have to work together to keep the string taut for all measurements.

6. Ask the students to take off their shoes for the rest of the activity. Tell the students that they will have five minutes to search for a "fist equal." Divide the class into teams of two students, and give each team a piece of string. If nobody discovers that the fist circumference is equal to the length of the foot, suggest that someone measure the length of his or her foot.

7. Ask the students when they might find it handy to know that the fist circumference and the foot length are nearly equal. Suggest to the students that they wrap the foot portion of one of their socks around their fists to see how they could use this measurement if they didn't know their actual sock size.



Finding "Equals"

1. Give each of the students the two pages of the Student Sheet, and ask them to fill in the answer to question #1. (Some students may have found other "fist equals"; encourage them to list these also.) Go over any terms on the Student Sheet that the students may not be familiar with.

2. Point out the body-height scales taped to the wall. Show the students how to measure body height for question #6. See the "Measuring Body Size" Technique Card.

3. Challenge the students to answer the questions on the Student Sheet.

4. The students may find other interesting measurements that are equal. Ask them to verify the ones they discover with another student. Circulate among the teams and lend assistance when needed.

5. Many teams will probably need help with question #6. This question deals with an interesting ratio between the distance from the floor to the belly button and the body height. This ratio is approximately .60 and, with little variation, applies to people of all sizes. Students can find this ratio in this way:

- With a book and the body-height scale, measure your body height in centimeters.
- While standing, your partner measures the distance from your belly button to the floor with a piece of string. Then hold the string against a body-height scale to get the measurement in centimeters.
- Divide your belly-button-to-floor distance by your height to get the ratio. If your students are not yet familiar with decimals, they can compute the relationship in percent. (Multiply the belly-button-to-floor distance by 100 and divide it by the body height. The quotient comes out in percent.) What is the class average?

d. **Example:**

Body height = 163 cm

Belly-button-to-floor = 99 cm

$99/163 = .61$ (rounded off to the nearest hundredth)

Or, computing by percent:

$99 \text{ cm} \times 100 = 9900 \text{ cm}$

$9900 \text{ cm} \div 163 \text{ cm} = 61\%$

This means that 61% of this person's total height is between her belly button and her feet.

DISCUSSING THE RESULTS

1. What were some of the interesting discoveries that you made?
2. Which equal measurements might be useful to know? Why?
3. What equal measurements did you discover on your own?

Body Proportion

1. At this point, take a few moments to introduce the concept of **body proportion**: the relation of the size of one body part to another. Ask the students why they think so many body-part match-ups apply to nearly everyone, e.g. fist circumference to foot length, height to arm span. If no one brings it up, explain that although people vary in height, weight, and body build, their body proportions are similar. To verify this, the students may want to compare the body proportions of a tall student and a short student.
2. Ask the students, "How would your movement or behavior change if:
 - a. Your arms were twice as long?
 - b. Your neck was as long as your arm?
 - c. Your feet were half their size?
 - d. Your head circumference equaled the length of your leg?"

ADDITIONAL CHALLENGES

1. Can you find another body part with a measurement that equals:
 - a. The length of your foot?
 - b. The circumference of your head?
 - c. The width of your shoulders?
 - d. The length of your ear?
2. Measure the body proportions of your parents. How do they compare with your own body proportions?

SIZE AND AGE

SYNOPSIS

The students measure their own body parts and those of older and younger students to discover growth trends.

HEALTH BACKGROUND

Human growth is very rapid during the first three years of life, but then the rate slows considerably until the early teenage years. Graphs that plot body height against age clearly illustrate an acceleration known as the **adolescent growth spurt**, which girls usually experience two years earlier than boys. For many young people, this sudden change in size is a startling, troubling event. Students who enter the growth spurt before or after the rest of their peers are especially likely to be self-conscious or uncomfortable about their size.

By discovering that variation in size is common at any age, and that different body parts grow at different rates, the students gain a better understanding of the occurrence, normal variation, and timing of the adolescent growth spurt.

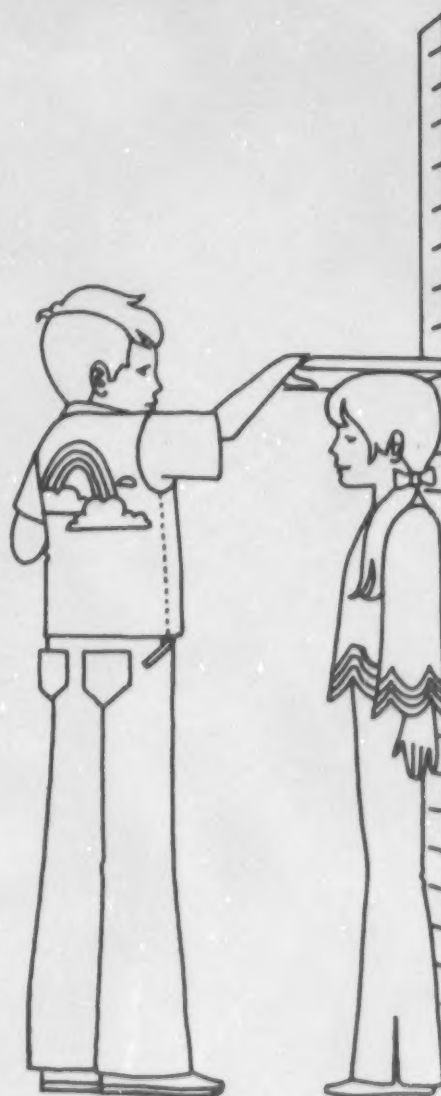
MATERIALS

For each student:

3 to 6 copies of the Student Sheet*

For the class:

- 4 body-height scales
- 4 30-cm rulers
- 5 graphs: "Body Height," "Trunk Height," "Leg Length," "Foot Length," and "Head Size"
- 400 yellow dots
- 400 green dots
- 10 meter tapes



12 hardbound books*
masking tape*

- 4 "Measuring Body Size" Technique Cards
- 1 "Averaging Method" Technique Card
- 1 duplicator master of the Student Sheet, "Measuring Your Body"

*Provided by the teacher

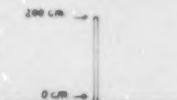
SETTING UP

Scheduling the Activity. Explaining the procedure and gathering data from all the classes will take one to two periods. Plan for at least a fifteen-minute discussion of the cumulative results.

Arranging the Class

1. Set up four measuring stations. Tape a "Measuring Body Size" Technique Card to the wall at each station.

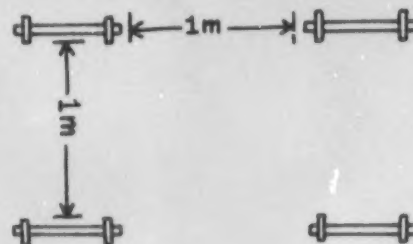
- a. **Body-Height Station.** Tape four body-height scales about one meter apart on a blank wall. the 0-cm end of the scale must be flush with the floor.



- b. **Trunk-Height Station.** Place four chairs with hard, flat seats against the wall. Leave enough space on either side of each chair for someone to stand. Behind each chair, attach a meter tape to the wall. The 0-cm end must be flush with the top surface of the chair seat.



- c. **Foot-Length Station.** Tape the four rulers one meter apart on the floor.



- d. **Head-Size Station.** Place the meter tapes at this station.

2. Arrange with several other teachers to have their students come to your class and be measured by your students. Your class should obtain data from at least two other grade levels. Try to include classes within a seven-year age span. Since younger classes of students may have difficulty calculating their own ages, you probably should obtain a list of the students' birthdates before the measuring takes place.
3. After you know the ages of the students from the different classes, fill in the age boxes at the bottom of each graph.
4. Make a copy of the Student Sheet for every student in your class and in the visiting classes. Tape all five graphs to the wall, and put the dots near them.
5. Write the months of the year, starting with January, in a row across the chalkboard. Circle the current month and label it "current month."

THE ACTIVITY

Introducing the Activity

1. Ask your students if they think they are bigger than children one year younger than they are. How much bigger? How can they find out? What should they measure? Encourage the students to make suggestions.
2. Point out the "Measuring Body Size" Technique Card at each station. Demonstrate each of the measuring techniques to the class.
3. **Calculating Leg Length.** Leg length is calculated by subtracting the trunk height from the body height. Do one or two calculations with the class to make sure that everyone knows how to calculate leg length.

SIZE AND AGE

Student Sheet

Name _____

MEASURING YOUR BODY

Name of person being measured: _____

Age of person being measured: _____ years _____ months

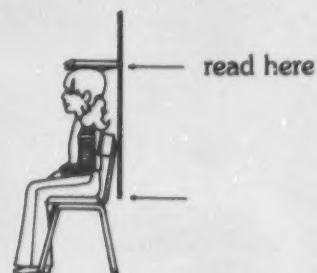
BODY HEIGHT



Your body height =

_____ centimeters

TRUNK HEIGHT



Your trunk height =

_____ centimeters

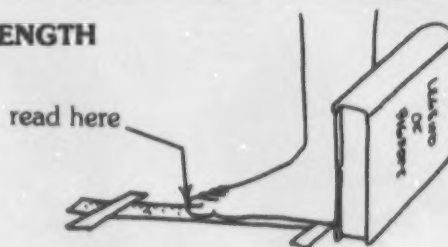
HEAD SIZE



Your head size =

_____ centimeters

FOOT LENGTH



Your foot length =

_____ centimeters

LEG LENGTH

Subtract your trunk height from your body height to get your leg length.

_____ centimeters, **Body Height**

— _____ centimeters, **Trunk Height**

Your **Leg Length** = _____ centimeters

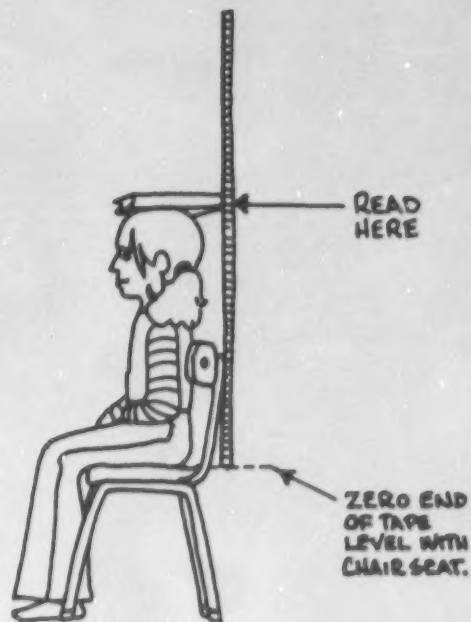
MEASURING BODY SIZE

Technique Card

Measuring Trunk Height

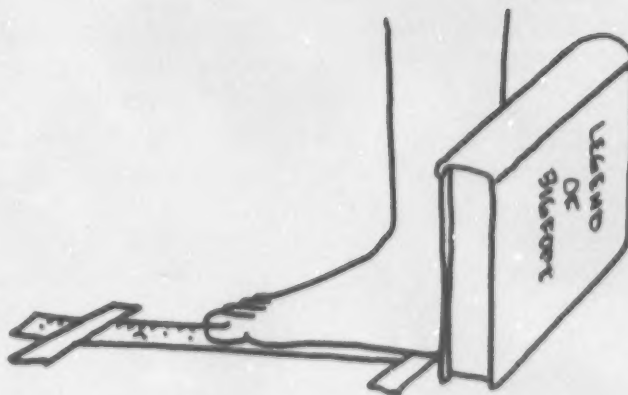
Trunk height is the distance from the buttocks to the top of the head.

1. The student being measured sits straight in the chair.
2. Place the book on her head. Make sure that the book is level.
3. Read the number where the *bottom* of the book touches the meter tape. This number is the student's trunk height in centimeters.



Measuring Foot Length

1. Hold a hardbound book upright on the floor. The front or back cover of the book should be flush with the 0-cm end of the ruler taped to the floor.
2. The student being measured removes one of her shoes and one of her socks, if necessary.
3. Have the student stand on the ruler with her heel against the book and her big toe centered on the ruler.
4. Read the number closest to the end of the big toe. This number is the student's foot length in centimeters.



Calculating Leg Length

To obtain the leg length, subtract the trunk height from the body height. The result of this subtraction is the student's leg length in centimeters.

Equals
How Tall Will You Be?
Size and Age
The Way We Grow
Up and Away

MEASURING BODY SIZE

Technique Card

Measuring Body Height

1. The student being measured takes off her shoes.
2. She stands with her back against the body-height scale.
3. Her heels, buttocks, and shoulders should touch the wall.
4. Make sure that she keeps her back as straight as possible.
5. Her feet should be flat on the floor and her heels close together.
6. Place the book on her head. Make sure that the book is level.
7. Read the number where the *bottom* of the book touches the body-height scale. This number is the student's height in centimeters.

Measuring Head Size

Head size is the distance around the upper part of the head.

1. Place the tape just above the student's eyebrows.
2. Hold the 0-cm end of the tape against the side of his head.
3. Wrap the tape snugly around the widest part of his head.
4. Read the tape number that meets the 0-cm end of the tape. This number is the student's head size in centimeters.



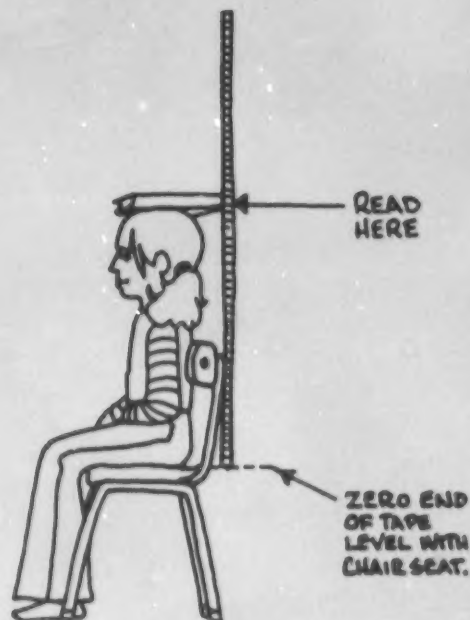
MEASURING BODY SIZE

Technique Card

Measuring Trunk Height

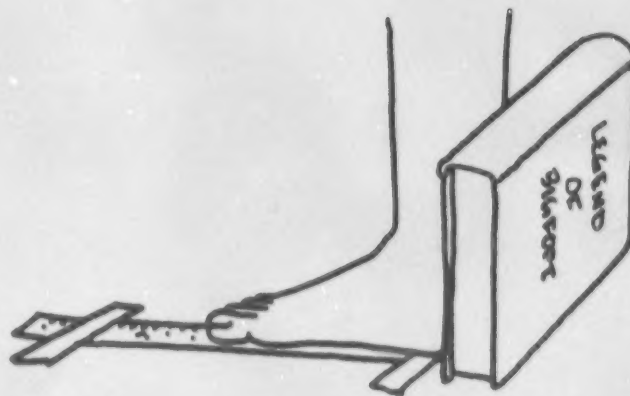
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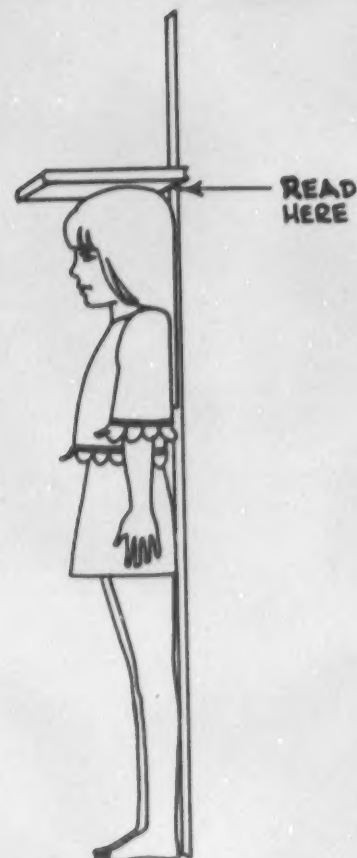
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Up and Away***

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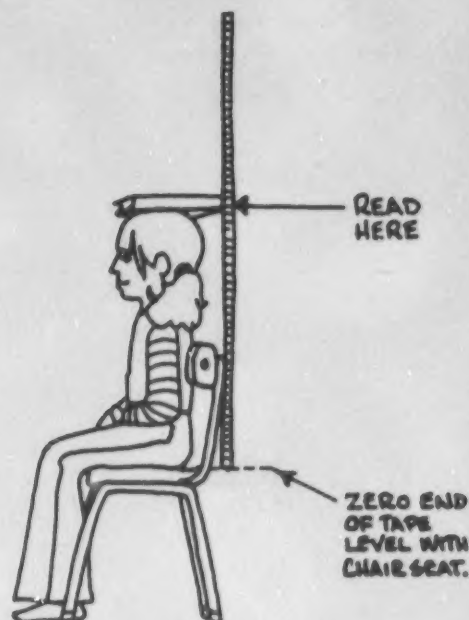
MEASURING BODY SIZE

Technique Card

Measuring Trunk Height

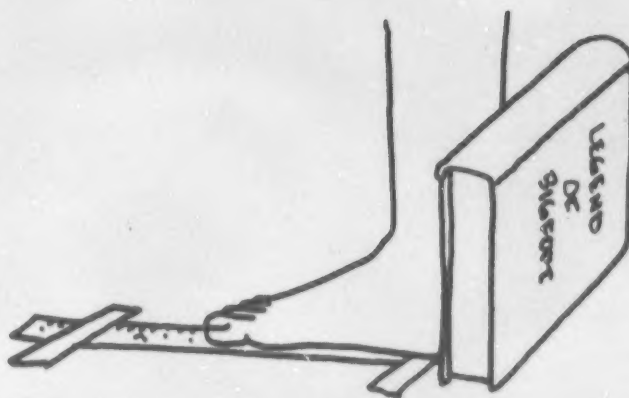
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Size and Age
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MEASURING BODY SIZE

Technique Card

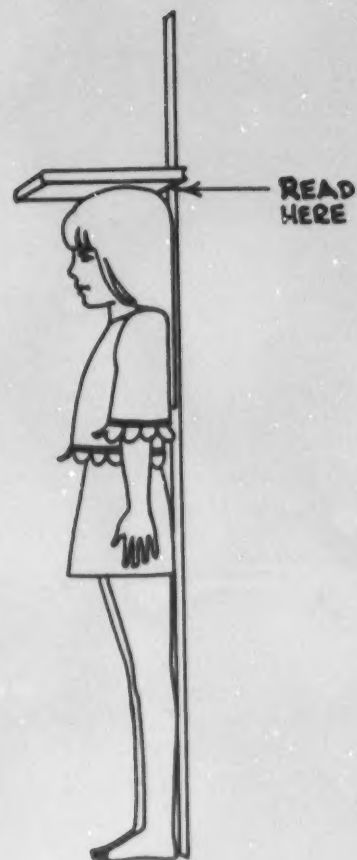
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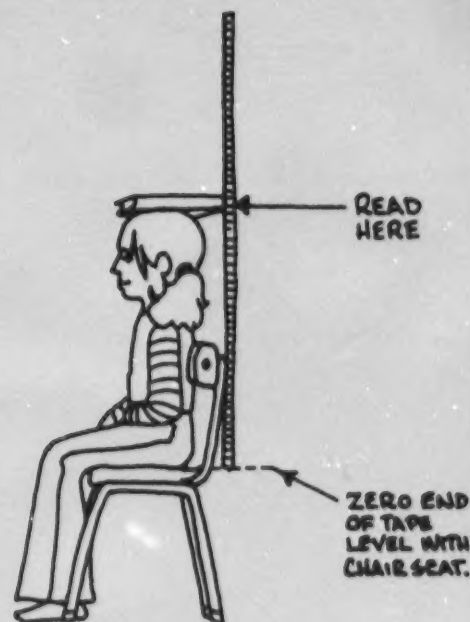
MEASURING BODY SIZE

Technique Card

Measuring Trunk Height

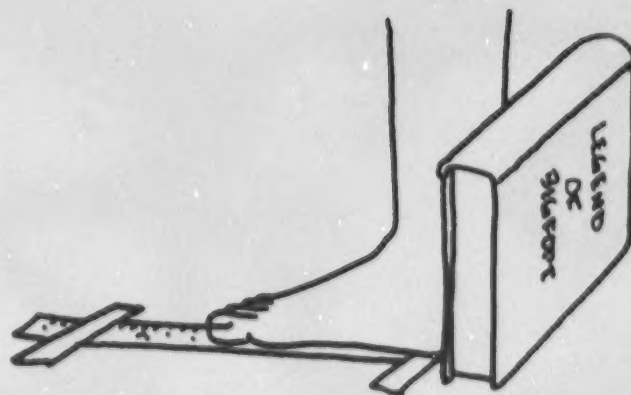
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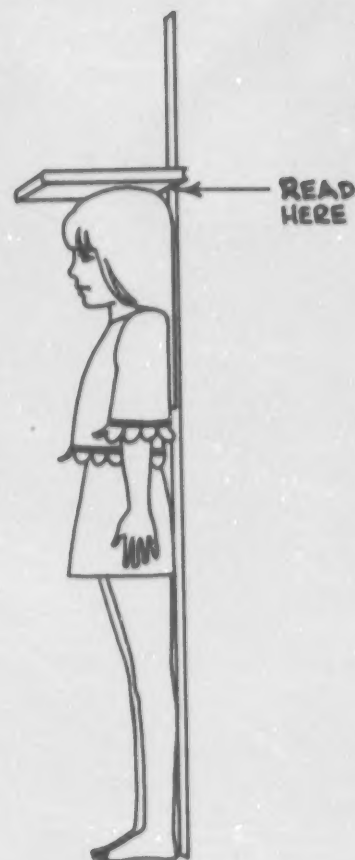
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**Blindfolded Traveler
Limber Up
Size and Age
The Way We Grow**

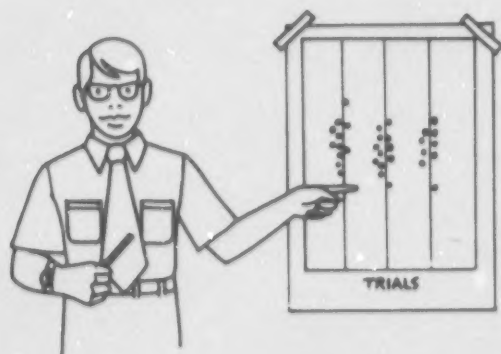
AVERAGING METHOD

Technique Card

This averaging technique eliminates the necessity of calculating an arithmetical average. Instead, this technique helps you locate a point that the class thinks best represents all the dots in one column (or row) of data.

To get this average:

1. Point out the highest and lowest dots in a column (or the two end dots in a row, if your data run horizontally), so that the students are aware of the entire range.
2. Place your finger at the top dot in the column (or at the last dot in a row).
3. Look at the class. *Do not look at the chart.*

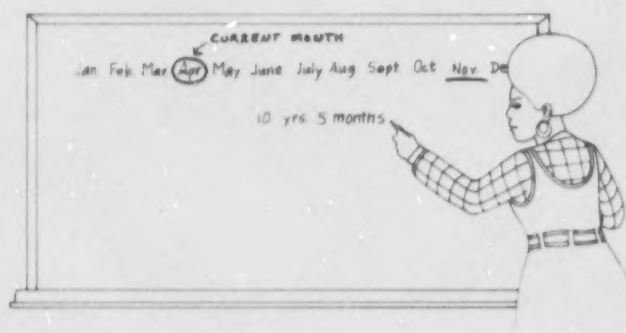


4. Tell the students to raise their hands when your finger reaches the point that best represents all the dots (the middle or average).

5. Move your finger slowly down the column (or back across the row). You will have to move your finger down the entire length of the column (or along the entire row of dots) to make sure that you don't stop at a point where a lot of hands are raised and miss a point further down (or back) where more hands might be raised. Then move your finger back to the area where a lot of hands were raised. Move your finger slowly up and down (or back and forth) around that area to find the precise point where the most hands are raised.

6. Mark that point with an X. Follow this procedure for each column (or row) of dots. Connect the X's with a felt-pen line.

4. **Calculating Age.** Explain to the students that in order to find out how body size changes with age, they will first have to figure out how old they are in years and months.
 - a. Stand by the list of months written on the board.
 - b. Ask someone how old she is and what month she was born in.
 - c. Underline that month, then name and count the months, with the month after her birthday being #1 and the current month being the last number.
 - d. **Example:** The student is 10 years old, was born in November, and this is April. December is 1, January is 2, February is 3, March is 4, and April is 5.
 - e. Have the student find her age (10 years and 5 months in this case) on the graph.



- f. Repeat this process with other birthdates until you are sure that the students understand how to determine age in years and months and that they know where to find the age on the graphs.
5. Distribute copies of the Student Sheet and have each student record his or her age.
6. **Graphing the Data.** Explain that after the students have made each measurement, they will put a dot (yellow for boys and green for girls) on the appropriate graph. Ask one student to show where she would place a dot for a specific age and measurement. Does the rest of the class agree? Give more examples until you are satisfied that the students understand how to position their dots on the graphs.

Gathering Data on Your Class

1. Assign students to work in pairs.
2. Partners will measure each other and record the data on the Student Sheet. Every student will place one dot on each of the five graphs.

Gathering Data From Other Classes

1. Before the visiting class arrives, distribute one Student Sheet to each student. Explain that each of your students will measure one child from the other class.
2. Each of your students must ask his visitor how old she is and what month she was born in, unless you previously obtained birthdates.
3. After your students have taken the measurements, have them supervise their visitors recording their data on the five graphs. Remind your students to use green dots for girls and yellow dots for boys.
4. Continue to measure other classes until the data span three to seven years.

DISCUSSING THE RESULTS

1. Look at each of the five graphs. How does the other class differ from ours in size? Are there any surprises?
2. On the "Body Height" graph, how many centimeters does the highest dot represent? How many does the lowest dot represent?
3. How many centimeters are there between these two heights? Tell the students that the highest number *minus* the lowest number *equals* the **range** of body heights.
4. Calculate the ranges of the other graphs. Which body part has the greatest range? Which has the smallest range?
5. For each graph, calculate the range within each age group (year). (**HINT:** Assign a different student to find the range for each age group on each graph. Instruct the students to draw a short, horizontal line through the highest dot and another line through the lowest dot within that year. The student can then subtract the lowest number from the highest number and write the difference on the graph at the top of the column for that year.)

6. Again, looking at the graphs, how do the ranges change with age? Why might that be?
7. What happens to the relationship in size measurements between the boys and girls at various ages? Does one or the other (boys or girls) always have larger measurements?
8. Do the graphs show growth spurts at any ages? Do boys differ from girls in the age at which they experience the spurt?

Optional Discussion. Helps the students find the average measurement of each age group for each measurement. Use the "Averaging Method" Technique Card.

1. Do all the students cluster around the average point fairly closely? Such a cluster is a **normal range**.
2. How many students are actually **average** (on the line) at each body measurement? (Few people are really average; variation is the rule, not the exception.)

ADDITIONAL CHALLENGE

Have your students predict the range of body height, trunk height, leg length, foot length, and head size for an age group they did *not* measure. Then invite a class of that age to be measured by your students. How many of the invited students fit into the predicted ranges?

THE WAY WE GROW

SYNOPSIS

By comparing sizes and shapes of human bodies at various ages, the students discover how human shape changes with growth.

By understanding the changes their bodies have already undergone, the students may be better able to deal with the physical changes that occur during adolescence and the differences that exist between individuals at various ages.

HEALTH BACKGROUND

Human shape changes continuously and dramatically between infancy and maturity due to the **differential** nature of growth: different parts of the body grow at different rates and in varying amounts. For this reason, the body has different proportions at various stages of development.

Newborn infants are quite similar in shape, with little size difference between boys and girls. Besides the differential growth of different body parts of an individual, amounts and rates of growth *between* individuals differ, accounting for the greater variation in the sizes and shapes of adults.

MATERIALS

For each student:

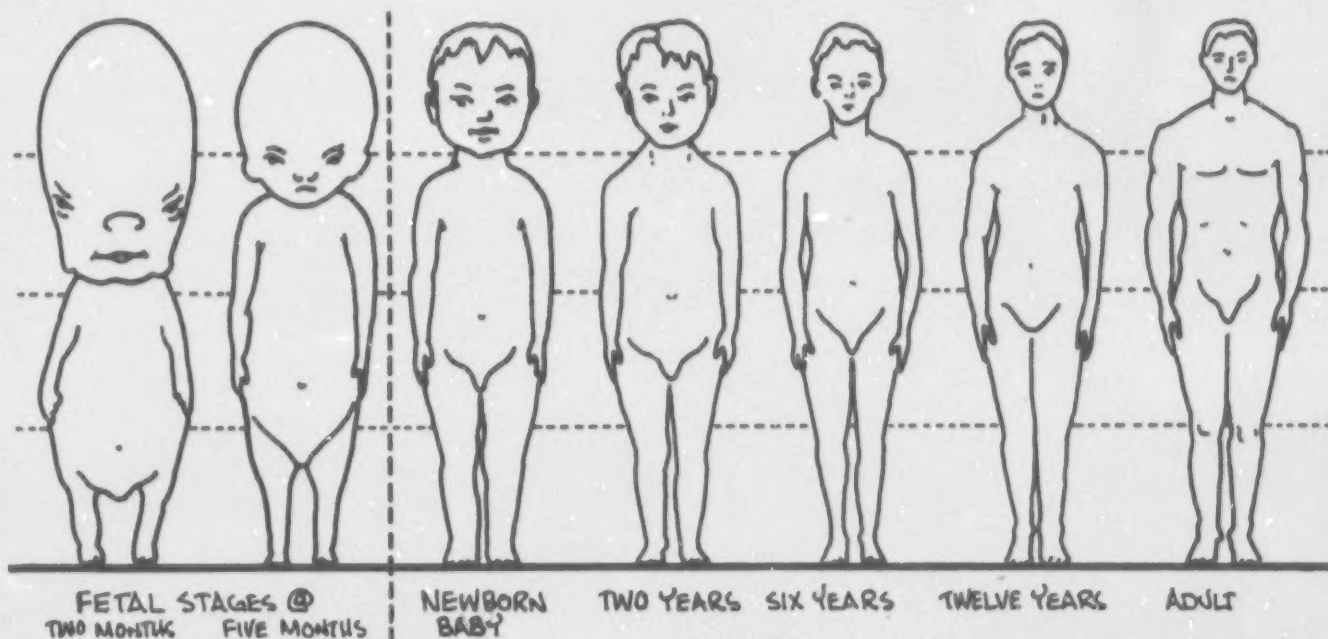
- 1 copy of Student Sheet 1*

For each pair of students:

- 1 copy of Student Sheets 2 and 3*

For the class:

- 4 body-height scales
- 16 pairs of calipers
- 12 meter tapes
- 1 "Life-Size Newborn Baby" chart
- 1 "The Way We Grow" class histogram
- 200 small yellow dots
- 200 small blue dots
- 10 large orange dots
- 1 "Measuring Body Size" Technique Card
- 1 "Averaging Method" Technique Card
- 4 hardbound books*



- 4 chairs*
- masking tape*
- 16 pairs of scissors*
- 1 duplicator master of Student Sheet 1 "Measuring Our Bodies"
- 1 duplicator master each of Student Sheets 2 and 3 "Infant Body Parts"

*Provided by the teacher and students

SETTING UP

Scheduling the Activity. This activity requires two fifty- to sixty-minute class periods. The best place to break the activity is after the **Averaging the Data** section.

Preparing for the Activity

1. Post the class histogram and the "Life-Size Newborn Baby" chart. Make the small dots available for the students near the histogram.
2. **Body-Height Station.** Tape four body-height scales about one meter apart on a wall. The 0-cm end of each scale must be flush with the floor.
3. **Trunk-Height Station.** Place four chairs with hard, flat seats against the wall. Leave enough space between the chairs for someone to stand. Behind each chair attach a meter tape to the wall. The 0-cm end must be flush with the top surface of the chair seat.
4. Tape eight meter tapes to the table or desk tops at convenient places in the room.
5. Make a copy of Student Sheet 1 for every student and one copy of Student Sheets 2 and 3 for each pair of students.

THE ACTIVITY

Introducing the Activity. Direct the students' attention to the "Life-Size Newborn Baby" chart on the wall. This outline is the result of averaging the measurements of many newborn baby boys and girls. Each measurement on the chart is designated by a letter (for example: C. Leg Length). The distance measured for each body part is the distance between the two points marked by the appropriate letter, e.g. the

distance between C and C' is the leg length. These measurements are also represented by black dots on the class histogram.

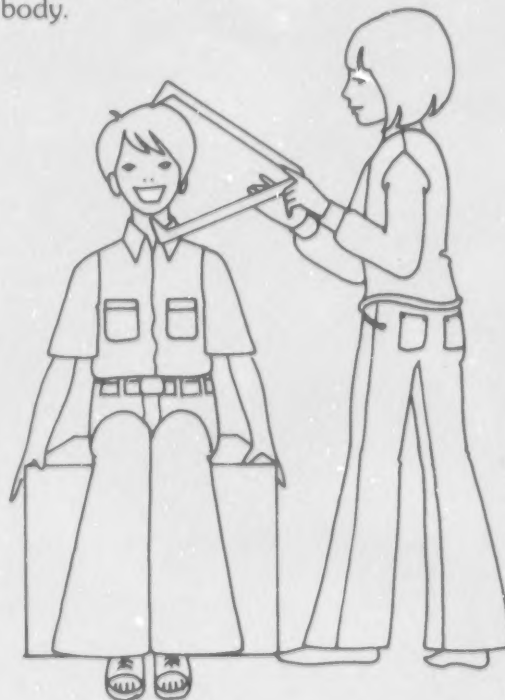
Demonstrating How to Make Body Measurements.

Ask a pair of students to help you show the students how to measure body parts.

1. **Measuring Body Height and Trunk Height, and Calculating Leg Length.** See the "Measuring Body Size" Technique Card for instructions on making these measurements.

2. **Measuring with Calipers.** The calipers are used for making the remaining seven body measurements: arm length, forearm length, foreleg length, shoulder width, hip width, head length, and head width. To use the calipers:

- a. One student places the tips of the calipers on the appropriate two points on her partner's body.



- b. Being careful not to change the caliper setting, she determines the measurement by placing one of the tips at the 0-cm end of a meter tape and reading the number for the length of that body part at the other tip. (Placing one tip on the 100-cm end of the tape is a common error.)

THE WAY WE GROW

Student Sheet 1

Name _____

MEASURING OUR BODIES

Using the Calipers

1. Place the tips of the calipers on the correct two points on the body part you are measuring.
2. Without changing the distance between the two tips, place one tip on the 0-cm end of the meter tape and read the number the other tip touches. This number is the length (or width).
3. Check for slippage by seeing if the distance you just measured still hits the same two points on your partner's body.



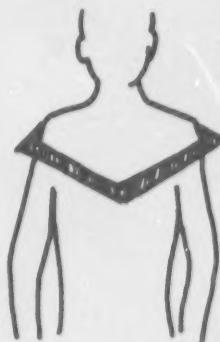
Your head width = ____ cm



Your head length = ____ cm



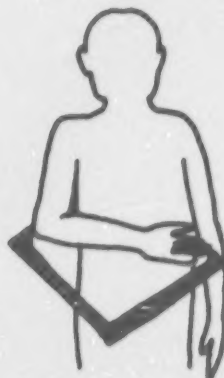
Your width across the hip bones = ____ cm



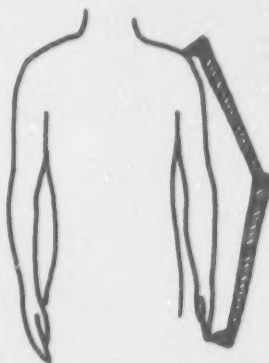
Your width across the shoulders = ____ cm



Your foreleg length = ____ cm



Your forearm length = ____ cm



Your arm length = ____ cm

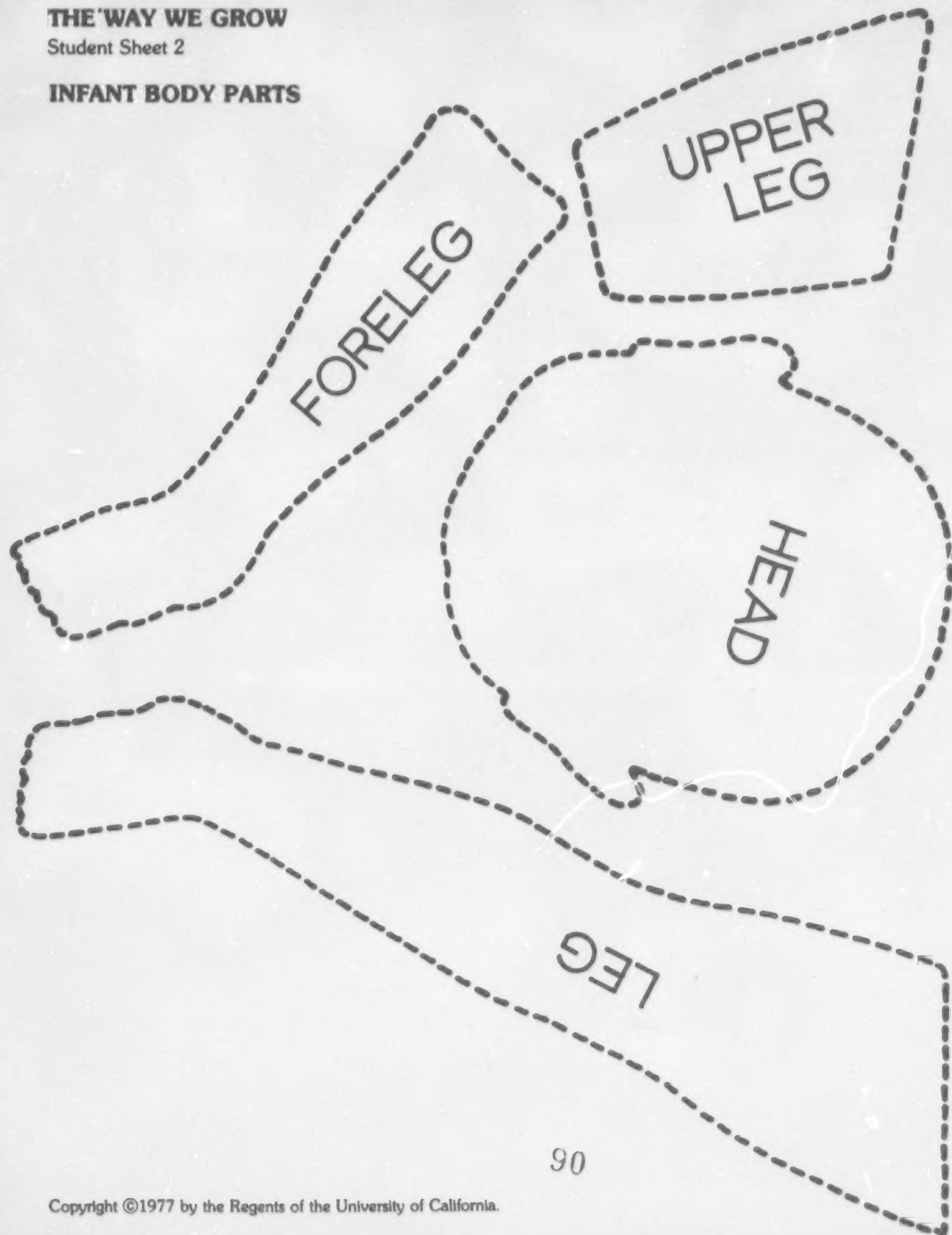
FINDING YOUR LEG LENGTH:

Your Body Height = ____ cm
 (minus)
 Your Trunk Height = ____ cm
 =
 (equals)
 Your Leg Length = ____ cm

THE WAY WE GROW

Student Sheet 2

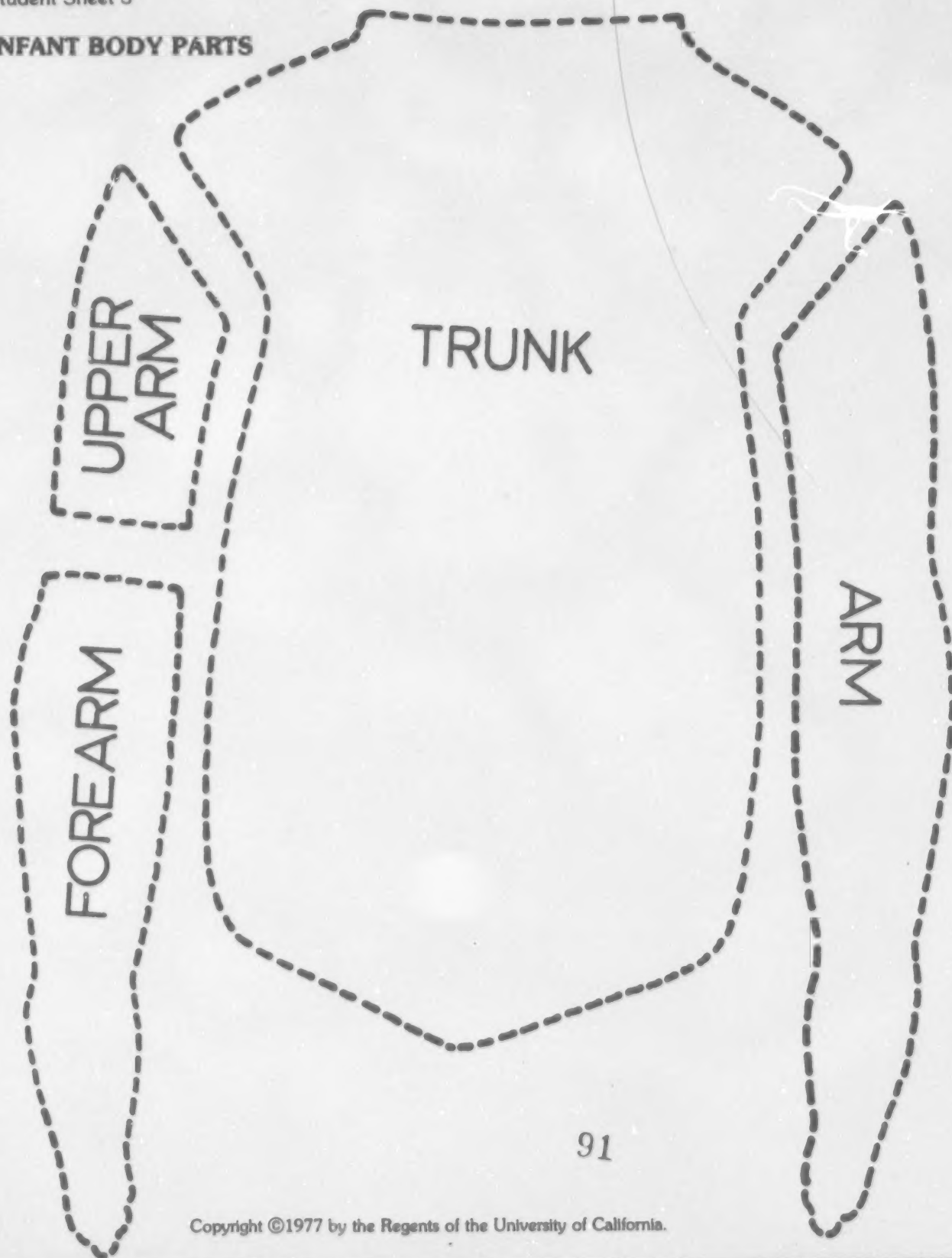
INFANT BODY PARTS



THE WAY WE GROW

Student Sheet 3

INFANT BODY PARTS



***Equals
How Tall Will You Be?
Size and Age
The Way We Grow
Up and Away***

MEASURING BODY SIZE

Technique Card

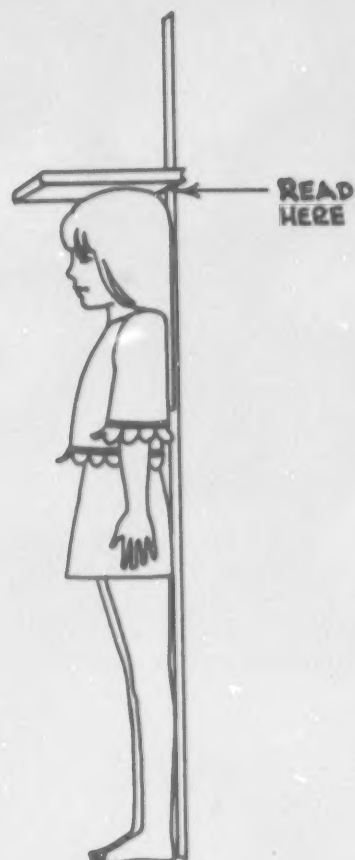
Measuring Body Height

1. The student being measured takes off her shoes.
2. She stands with her back against the body-height scale.
3. Her heels, buttocks, and shoulders should touch the wall.
4. Make sure that she keeps her back as straight as possible.
5. Her feet should be flat on the floor and her heels close together.
6. Place the book on her head. Make sure that the book is level.
7. Read the number where the *bottom* of the book touches the body-height scale. This number is the student's height in centimeters.

Measuring Head Size

Head size is the distance around the upper part of the head.

1. Place the tape just above the student's eyebrows.
2. Hold the 0-cm end of the tape against the side of his head.
3. Wrap the tape snugly around the widest part of his head.
4. Read the tape number that meets the 0-cm end of the tape. This number is the student's head size in centimeters.



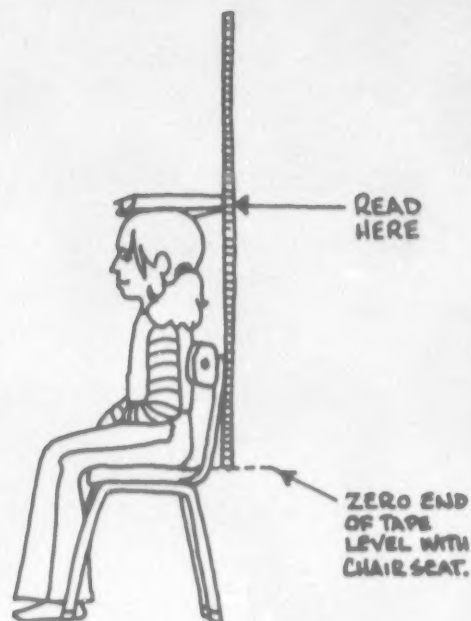
MEASURING BODY SIZE

Technique Card

Measuring Trunk Height

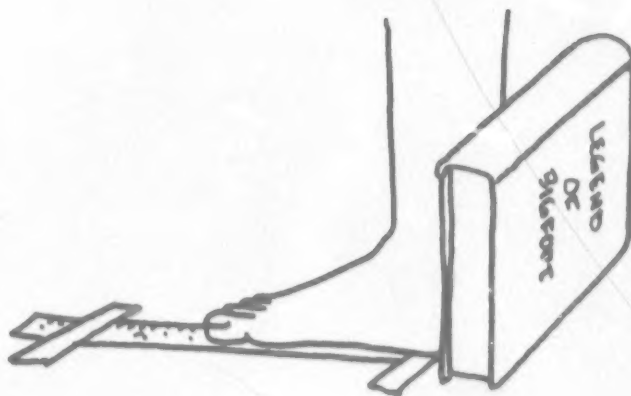
Trunk height is the distance from the buttocks to the top of the head.

1. The student being measured sits straight in the chair.
2. Place the book on her head. Make sure that the book is level.
3. Read the number where the *bottom* of the book touches the meter tape. This number is the student's trunk height in centimeters.



Measuring Foot Length

1. Hold a hardbound book upright on the floor. The front or back cover of the book should be flush with the 0-cm end of the ruler taped to the floor.
2. The student being measured removes one of her shoes and one of her socks, if necessary.
3. Have the student stand on the ruler with her heel against the book and her big toe centered on the ruler.
4. Read the number closest to the end of the big toe. This number is the student's foot length in centimeters.



Calculating Leg Length

To obtain the leg length, subtract the trunk height from the body height. The result of this subtraction is the student's leg length in centimeters.

**Blindfolded Traveler
Limber Up
Size and Age
The Way We Grow**

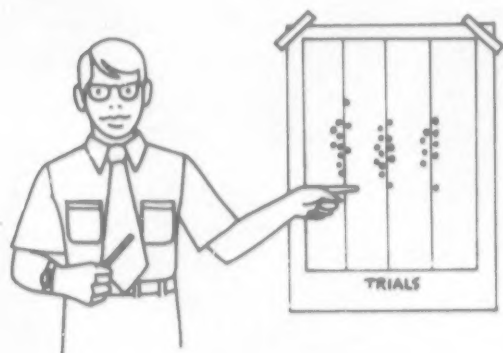
AVERAGING METHOD

Technique Card

This averaging technique eliminates the necessity of calculating an arithmetical average. Instead, this technique helps you locate a point that the class thinks best represents all the dots in one column (or row) of data.

To get this average:

1. Point out the highest and lowest dots in a column (or the two end dots in a row, if your data run horizontally), so that the students are aware of the entire range.
2. Place your finger at the top dot in the column (or at the last dot in a row).
3. Look at the class. *Do not look at the chart.*
4. Tell the students to raise their hands when your finger reaches the point that best represents all the dots (the middle or average).
5. Move your finger slowly down the column (or back across the row). You will have to move your finger down the entire length of the column (or along the entire row of dots) to make sure that you don't stop at a point where a lot of hands are raised and miss a point further down (or back) where more hands might be raised. Then move your finger back to the area where a lot of hands were raised. Move your finger slowly up and down (or back and forth) around that area to find the precise point where the most hands are raised.
6. Mark that point with an X. Follow this procedure for each column (or row) of dots. Connect the X's with a felt-pen line.



- c. She then checks her calipers for slippage by seeing if the setting she just measured still hits the same two points on her partners's body.

Measuring Body Parts

1. Divide the class into pairs. Give each pair of students a set of calipers and two copies of Student Sheet 1.
2. Have the students make the seven caliper measurements illustrated on Student Sheet 1 and record each measurement in the appropriate box.
3. When all the caliper measurements have been made, have the students proceed to the Body-Height Station and the Trunk-Height Station to make these measurements. Leg length is calculated by subtracting the trunk height from the body height. The students also record these measurements on Student Sheet 1.
4. Each student places one small dot on the class histogram for each of his or her ten body measurements. The girls use blue dots and the boys use yellow dots. Instruct the students not to place one dot on top of another, but next to the first dot in that space.

Averaging the Data. With the class, average the data for each body measurement. (See the "Averaging Method" Technique Card, steps 1-5.) Place a large orange dot on each average point. Do not connect the points.

DISCUSSING THE RESULTS

Body Growth. The following discussion develops the concept of differential growth of body parts. Encourage the students to refer to the histogram while answering these questions.

1. What is the average body height for an infant?
2. What is the average body height for your class?
3. How many infant body heights fit into the average body height of your class? To help your students make this estimate, position the calipers so that one tip is in the center of the black dot representing the average infant body height and the other tip is on the base line of the class histogram. Being careful not to change the setting (the distance between the tips), find out how many of these distances fit into the average body height of your class. Write this number at the top of the Body Height column. (Some of the numbers may be fractions.)
4. Repeat questions 1-3 for the rest of the measurements your students made.
5. Excluding body height, which of the class's average measurements contain the largest number of infant measurements?

Individual Comparison

1. Divide the class into pairs and give each pair a copy of Student Sheets 2 and 3 and a pair of scissors.
2. The partners can take turns cutting out the infant body parts.
3. Each pair then compares the length of these cut-out body parts to the length of corresponding parts of their own bodies.
4. Explain to the students that they are comparing the same measurements as before, but this time on an individual basis instead of using the class average for comparison.



Individual Growth. This discussion develops the concept of unique individual growth. You will need to determine the numerical values for each of the average measurements (represented by the orange dots) for your class.

1. Ask the students: "How does the development of your body parts compare with the class average?" Tell the students that as you announce each average measurement, they should place one of the following letters next to each illustration on the Student Sheet:

L if their measurement is **larger** than the average,

S if their measurement is **smaller** than the average, and

A if their measurement is **average**.

2. Do all of your measurements fall in the same category, i.e. larger, smaller, or average?

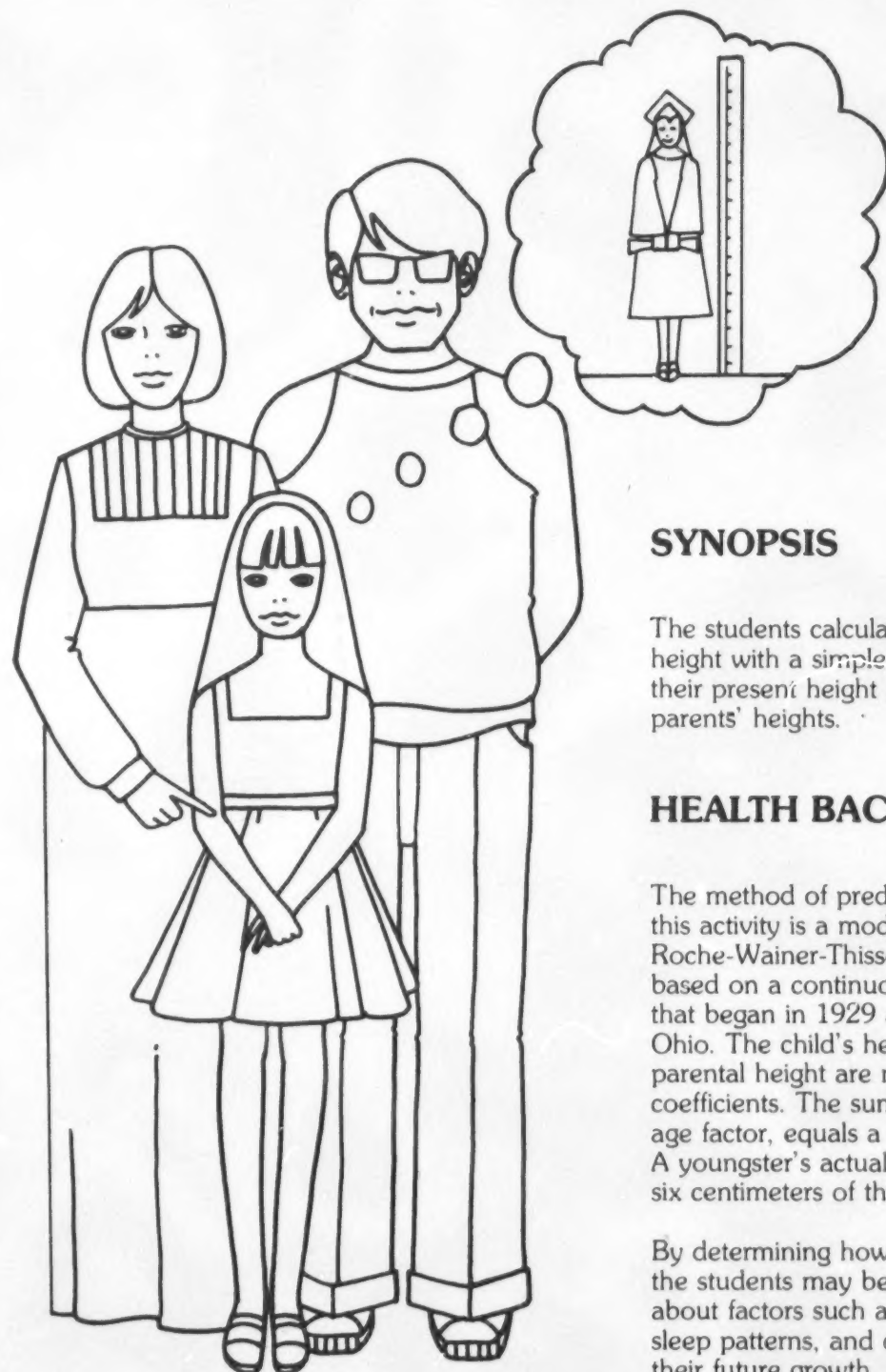
3. Are there some periods of your life when your body grows faster than during other periods? If so, when?



ADDITIONAL CHALLENGE

Invite a student who is in a class two grades ahead of your class to your classroom. The student should be bigger than any of your students. Have him lie down on a piece of butcher paper. Draw an outline of his body. Then have one of your students lie down on the paper with her hips in the same position as the older student's hips. Draw her outline. Repeat the procedure with a student two years behind your students. This student should be smaller than any of your students. Have the students discuss the changes in shape that have occurred.

HOW TALL WILL YOU BE?



SYNOPSIS

The students calculate their probable adult height with a simple formula based on their present height and weight, and their parents' heights.

HEALTH BACKGROUND

The method of predicting adult height used in this activity is a modified version of the Roche-Wainer-Thissen (RWT) method, which is based on a continuous study of human growth that began in 1929 at Fels Research Institute in Ohio. The child's height, weight, and average parental height are multiplied by sex/age-specific coefficients. The sum of these products, plus an age factor, equals a youngster's predicted height. A youngster's actual adult height will fall within six centimeters of this figure in 90% of the cases.

By determining how much more they may grow, the students may become more concerned about factors such as diet, exercise, disease, sleep patterns, and drug use that might affect their future growth.

MATERIALS

For each student:

- 1 copy of Student Sheets 1 and 2*

For the class:

- 1 kilogram weight scale
- 4 body-height scales
- 4 hardbound books*
- 1 "Converting Inches to Centimeters" Technique Card
- 1 "Measuring Body Size" Technique Card
- 1 duplicator master of Student Sheet 1, "Personal Data Worksheet"
- 1 duplicator master of Student Sheet 2, "Table of Multipliers"
- 1 or more hand-held calculators* (optional)

*Provided by the teacher

SETTING UP

Scheduling the Activity. Session One

requires one forty- to sixty-minute class period. Between Sessions One and Two, the students measure or find out the heights of their parents.

Session Two requires one or two class periods, depending on your students' math skills.

Preparing for the Activity

1. At four places in the room, set out a hardbound book and fasten a body-height scale to the wall, with the 0-cm end of the scale flush with the floor. The height scales will be used in both sessions.
2. Set out the kilogram weight scale.
3. Write the months of the year, starting with January, in a horizontal row across the chalkboard. Circle the current month and label it "current month."
4. Make a copy of each Student Sheet for every student.

THE ACTIVITY

Session One

Introducing the Activity

1. Ask the students how tall they think they will be when they are fully grown. Why do they predict these particular heights?
2. Give each student a worksheet (Student Sheet 1). Have the students record their predictions (item #1).
3. Explain that you have a formula they can use to predict their probable adult heights. The formula resulted from a process in which measurements were made of people when they were children and when they had grown to their adult heights. The relationship between these measurements was made into a formula. To use this formula, each student will have to find out his or her:
 - a. Height
 - b. Weight
 - c. Age in years and months
 - d. Parents' heights

Demonstrating How to Measure Body Height. Follow the **Measuring Body Height** procedure outlined on the "Measuring Body Size" Technique Card.

Demonstrating How to Measure Body Weight. Show the students the weight scale. Ask them how they can be sure that they will obtain an accurate measurement (waiting until the numbers stop moving before reading the weight, standing with both feet on the scale, taking off shoes and heavy outer garments). Explain to the students that they will need to know their weight in kilograms, which they can obtain by reading the **red** numbers. (The blue numbers give weight in pounds.)

Measuring Height and Weight. Divide the class into pairs. Have the partners measure each other at the body-height scales. Each student can measure his own weight at the weight scale. Each student then records his height (item #2a) and his weight (item #3a) on his worksheet.

HOW TALL WILL YOU BE?

Student Sheet 1

Name _____

PERSONAL DATA WORKSHEET

1. I predict that my height as an adult will be _____ cm. I predict this height because _____

2a. My height in cm b. $\times$ Height multiplier (from chart) c. Put this answer in Box 1 under #5.	5. Box 1 Box 2 - Subtract Box 2 from Box 1, and put the answer in Box 3
3a. My weight in kg b. $\times$ Weight multiplier (from chart) c. Put this answer in Box 2 under #5.	Box 3 Box 4 + Add Box 3 to Box 4, and put the answer in Box 5
4a. Mother's height in cm b. $+$ Father's height in cm c. Total $\div 2 =$ d. $\times$ Parent multiplier (from chart) e. Put this answer in Box 4 under #5.	Box 5 Box 6 Age multiplier: If +, add to Box 5. If -, subtract from Box 5. Put answer in Box 7 Box 7 Divide Box 7 by 100, and put the answer in Box 8 Box 8 This is your probable adult height in cm.

6. My adult height will probably be between a. _____ and b. _____ centimeters tall.
(Box 8 minus 6 cm) (Box 8 plus 6 cm)

7. To reach my probable adult height, I will have to grow a. _____ to b. _____ centimeters taller.
(6a minus present height - 2a) (6b minus present height - 2a)

HOW TALL WILL YOU BE?

Student Sheet 2

TABLE OF MULTIPLIERS — BOYS

AGE	Ht Mult	Wt Mult	Parent Mult	Age Mult	AGE	Ht Mult	Wt Mult	Parent Mult	Age Mult
7-0	112	47	37	-1030	12-6	84	18	41	-1160
7-1, 2	112	46	37	-1040	12-7	83	18	42	-1120
7-3, 4	111	45	37	-1050	12-8	82	18	42	-1090
7-5	111	44	37	-1060	12-9	82	18	42	-1040
7-6	111	43	37	-1060	12-10	81	18	42	- 990
7-7	110	43	36	-1070	12-11	80	17	42	- 940
7-8	110	42	36	-1080	13-0	79	17	42	- 900
7-9	110	42	36	-1090	13-1	79	17	42	- 850
7-10, 11	110	41	36	-1110	13-2	78	17	42	- 800
8-0	109	40	36	-1130	13-3	77	16	42	- 750
8-1, 2	109	39	36	-1450	13-4	77	16	42	- 700
8-3	109	38	36	-1170	13-5	76	16	42	- 640
8-4	108	38	36	-1180	13-6	76	16	42	- 590
8-5	108	37	36	-1200	13-7	75	15	42	- 530
8-6	108	37	35	-1210	13-8	75	15	42	- 480
8-7	108	36	35	-1230	13-9	74	15	42	- 420
8-8, 9	107	35	35	-1250	13-10	73	14	42	- 360
8-10, 11	107	34	35	-1280	13-11	73	14	41	- 300
9-0, 1	106	33	35	-1310	14-0	72	14	41	- 240
9-2, 3	106	32	35	-1350	14-1	72	13	41	- 190
9-4, 5	105	31	35	-1380	14-2	72	13	40	- 130
9-6, 7	104	30	36	-1410	14-3	71	12	40	- 70
9-8, 9	104	30	36	-1440	14-4	71	12	40	- 20
9-10, 11	103	28	36	-1460	14-5	71	12	39	+ 40
10-0, 1	102	28	36	-1490	14-6	71	11	39	+ 90
10-2, 3	101	27	36	-1510	14-7	71	11	38	+ 140
10-4, 5	100	26	37	-1520	14-8	71	10	37	+ 190
10-6, 7	99	25	37	-1530	14-9	71	10	37	+ 240
10-8, 9	98	25	37	-1530	14-10	71	9	36	+ 280
10-10, 11	97	24	37	-1530	14-11	71	9	35	+ 320
11-0, 1	96	23	38	-1530	15-0	72	8	34	+ 360
11-2, 3	95	23	38	-1520	15-1	72	8	33	+ 390
11-4, 5	94	22	39	-1500	15-2	73	7	32	+ 420
11-6, 7	92	21	39	-1470	15-3	73	6	31	+ 450
11-8, 9	91	21	40	-1430	15-4	74	6	30	+ 470
11-10, 11	90	20	40	-1390	15-5	75	5	28	+ 480
12-0	88	20	40	-1350	15-6	76	4	27	+ 490
12-1	87	20	41	-1320	15-7	77	3	26	+ 490
12-2	87	19	41	-1300	15-8	78	2	24	+ 490
12-3	86	19	41	-1260	15-9	79	1.5	22	+ 480
12-4	85	19	41	-1230	15-10	81	.5	21	+ 450
12-5	85	19	41	-1200	15-11	82	0	19	+ 420

HOW TALL WILL YOU BE?

Student Sheet 2

TABLE OF MULTIPLIERS — GIRLS

AGE	Ht Mult	Wt Mult	Parent Mult	Age Mult	AGE	Ht Mult	Wt Mult	Parent Mult	Age Mult
7-0	107	56	19	+1650	11-0, 1	74	19	22	+3000
7-1	106	55	19	+1660	11-2, 3	73	18	22	+3040
7-2	106	54	19	+1670	11-4, 5	72	18	21	+3080
7-3	105	53	19	+1680	11-6, 7	72	17	21	+3100
7-4	104	52	19	+1700	11-8, 9	71	16	21	+3120
7-5	104	51	19	+1710	11-10, 11	71	16	21	+3120
7-6	103	50	19	+1730	12-0	71	15	20	+3110
7-7	102	49	19	+1750	12-1	71	15	20	+3100
7-8	101	48	19	+1760	12-2	71	15	20	+3080
7-9	101	47	19	+1790	12-3	71	14	19	+3060
7-10	100	46	20	+1810	12-4	72	14	19	+3040
7-11	99	45	20	+1830	12-5	72	14	19	+3010
8-0	98	44	20	+1850	12-6	72	14	18	+2980
8-1	98	43	20	+1870	12-7	72	13	18	+2940
8-2	97	42	20	+1900	12-8	73	13	18	+2900
8-3	96	41	20	+1920	12-9	73	13	17	+2850
8-4	95	40	20	+1950	12-10	74	13	17	+2800
8-5	94	39	20	+1980	12-11	75	12	16	+2730
8-6	94	38	20	+2000	13-0	75	12	16	+2660
8-7	93	38	20	+2030	13-1	76	12	16	+2580
8-8	92	37	20	+2060	13-2	77	12	15	+2500
8-9	91	36	20	+2090	13-3	78	11	14	+2410
8-10	91	35	20	+2120	13-4	79	11	14	+2320
8-11	90	34	21	+2150	13-5	80	11	13	+2210
9-0, 1	89	33	21	+2210	13-6	81	11	13	+2100
9-2, 3	88	32	21	+2270	13-7	82	10	12	+1970
9-4, 5	86	30	21	+2340	13-8	84	10	11	+1840
9-6, 7	85	29	21	+2410	13-9	85	10	11	+1700
9-8, 9	83	28	21	+2480	13-10	87	9	10	+1550
9-10, 11	82	26	22	+2560	13-11	88	9	9	+1390
10-0, 1	80	25	22	+2620	14-0	90	8	8	+1220
10-2, 3	79	24	22	+2700					
10-4, 5	78	23	22	+2770					
10-6, 7	77	22	22	+2830					
10-8, 9	76	21	22	+2890					
10-10, 11	75	20	22	+2950					

FOR GIRLS OVER AGE 14-0, USE THE
VALUES IN THE LAST ENTRY.

How Tall Will You Be?

CONVERTING INCHES TO CENTIMETERS

Technique Card

(1 inch = 2.54 centimeters)

Feet & Inches	=	Centimeters	Feet & Inches	=	Centimeters
3' 0"		91.4	5' 0"		152.4
3' 1"		94	5' 1"		154.9
3' 2"		96.5	5' 2"		157.5
3' 3"		99.1	5' 3"		160
3' 4"		101.6	5' 4"		162.6
3' 5"		104.1	5' 5"		165.1
3' 6"		106.7	5' 6"		167.6
3' 7"		109.2	5' 7"		170.2
3' 8"		111.8	5' 8"		172.7
3' 9"		114.3	5' 9"		175.3
3' 10"		116.8	5' 10"		177.8
3' 11"		119.4	5' 11"		180.3
4' 0"		121.9	6' 0"		182.9
4' 1"		124.5	6' 1"		185.4
4' 2"		127	6' 2"		188
4' 3"		129.5	6' 3"		190.5
4' 4"		132.1	6' 4"		193
4' 5"		134.6	6' 5"		195.6
4' 6"		137.2	6' 6"		198.1
4' 7"		139.7	6' 7"		200.7
4' 8"		142.2	6' 8"		203.2
4' 9"		144.8	6' 9"		205.7
4' 10"		147.3	6' 10"		208.3
4' 11"		149.9	6' 11"		210.8
5' 0"		152.4	7' 0"		213.4

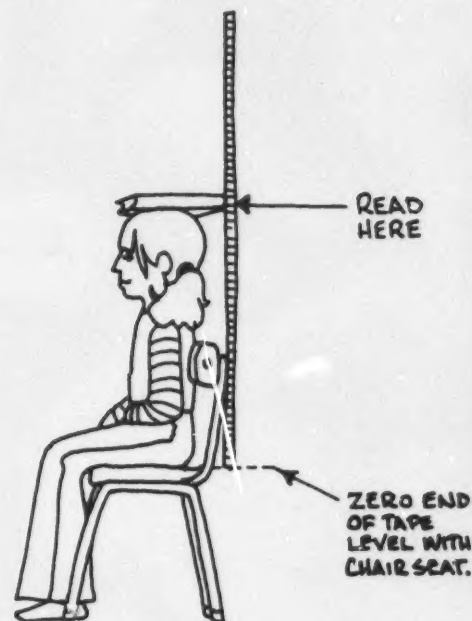
MEASURING BODY SIZE

Technique Card

Measuring Trunk Height

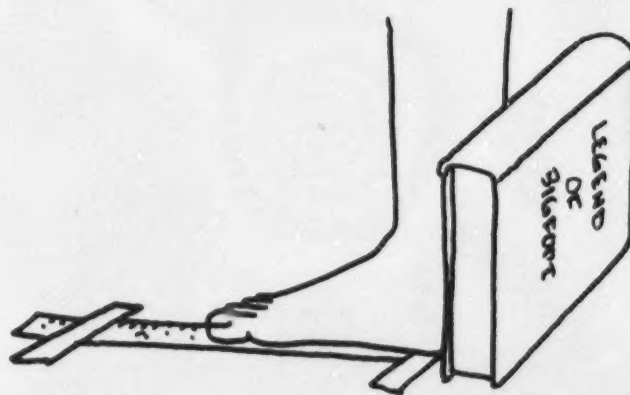
Trunk height is the distance from the buttocks to the top of the head.

1. The student being measured sits straight in the chair.
2. Place the book on her head. Make sure that the book is level.
3. Read the number where the *bottom* of the book touches the meter tape. This number is the student's trunk height in centimeters.



Measuring Foot Length

1. Hold a hardbound book upright on the floor. The front or back cover of the book should be flush with the 0-cm end of the ruler taped to the floor.
2. The student being measured removes one of her shoes and one of her socks, if necessary.
3. Have the student stand on the ruler with her heel against the book and her big toe centered on the ruler.
4. Read the number closest to the end of the big toe. This number is the student's foot length in centimeters.



Calculating Leg Length

To obtain the leg length, subtract the trunk height from the body height. The result of this subtraction is the student's leg length in centimeters.

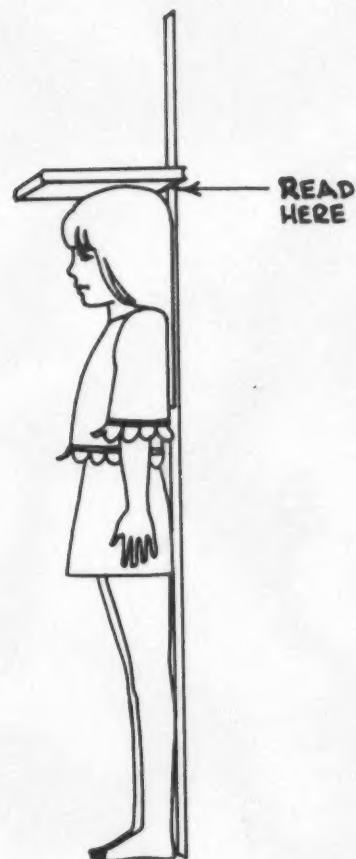
Equals
How Tall Will You Be?
Size and Age
The Way We Grow
Up and Away

MEASURING BODY SIZE

Technique Card

Measuring Body Height

1. The student being measured takes off her shoes.
2. She stands with her back against the body-height scale.
3. Her heels, buttocks, and shoulders should touch the wall.
4. Make sure that she keeps her back as straight as possible.
5. Her feet should be flat on the floor and her heels close together.
6. Place the book on her head. Make sure that the book is level.
7. Read the number where the *bottom* of the book touches the body-height scale. This number is the student's height in centimeters.



Measuring Head Size

Head size is the distance around the upper part of the head.

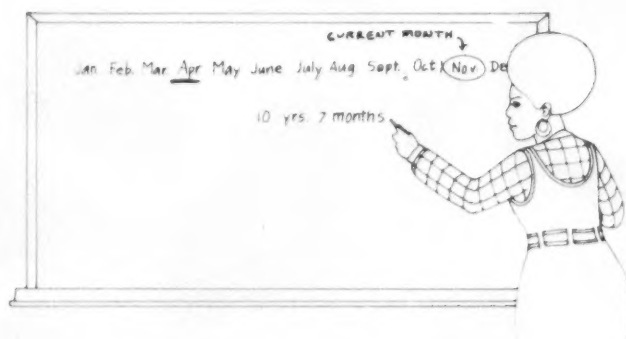
1. Place the tape just above the student's eyebrows.
2. Hold the 0-cm end of the tape against the side of his head.
3. Wrap the tape snugly around the widest part of his head.
4. Read the tape number that meets the 0-cm end of the tape. This number is the student's head size in centimeters.



Calculating Age

1. Explain to the students that in order to make an accurate prediction of their adult height, they must know their age in years and months at the time their height and weight are being measured.

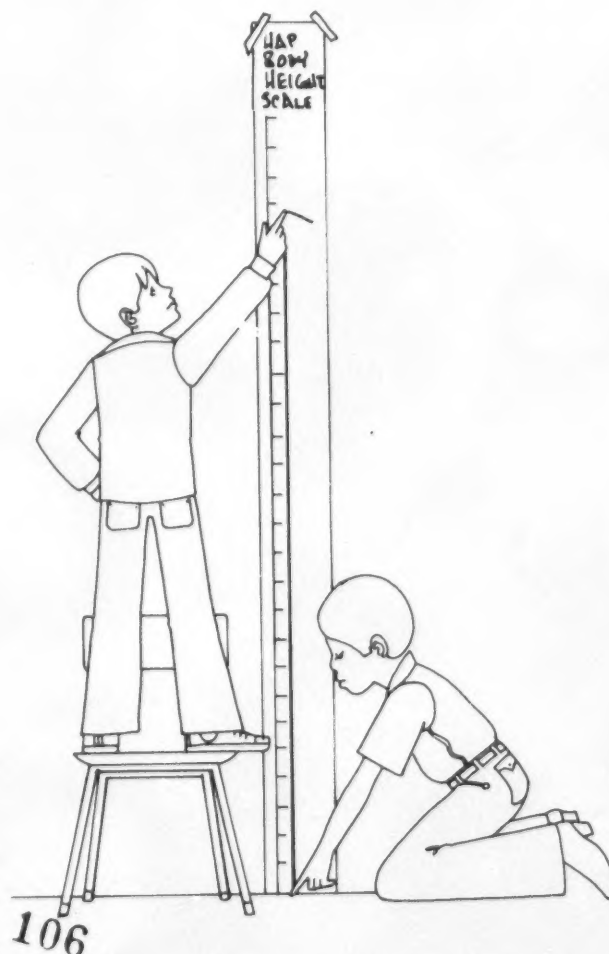
- Stand by the list of months written on the chalkboard.
- Ask someone how old he is and what month he was born in.
- Underline that month, then name and count the months, with the month after his birthday being #1 and the current month being the last number.
- Example:** The student is 10 years old, was born in April, and this is November. May is 1, June is 2, July is 3, August is 4, September is 5, October is 6, and November is 7. The student is now 10 years and 7 months old.



2. Repeat this process with other birthdates until you are sure that the students understand how to determine age in years and months.

Finding the Correct Multipliers. Distribute one copy of Student Sheet 2, "Table of Multipliers," to each student. Direct the students to use the appropriate page for their sex. Each student is to find his or her age, in years and months, on the table. To the right of that age are the height, weight, parent, and age multipliers that the student should copy onto the worksheet in the appropriate ovals.

Measuring Parental Height. Announce that, as a home assignment, each student should find out the height of his parents in either centimeters (preferably) or feet and inches. (Use the "Converting Inches to Centimeters" Technique Card to help the students convert feet-and-inch heights.) Some students may wish to bring in a piece of ribbon or string that is as long (tall) as each parent and measure the string on the body-height scale. The measurements must be of real parents, not step, foster, or adopted parents. If a student cannot obtain the height of either or both real parents, he can substitute the average adult height of American men (174 cm) and women (162 cm). (Take care that you don't hurt the feelings of any child who cannot obtain a real parent's height.)



Session Two

Measuring Parental Height. Have the partners use the body height scales to help each other measure the strings that represent their parents' heights. The students should record parental heights (or average adult heights if parental heights cannot be obtained) in centimeters on their worksheets (item #4a and 4b).

If an absent, real parent's height is known in feet and inches, help the student convert the height to centimeters using the "Converting Inches to Centimeters" Technique Card.

Completing Student Sheet 1

1. Direct the students to complete items 2, 3, and 4, and then complete section 5. Suggest that the partners check each other's work for arithmetic mistakes. (Optional hand-held calculators may speed this process.)
2. After the students have computed their probable adult heights (Box 8), explain to the class that the scientists who developed this formula discovered that almost all the boys and girls (90%) taking part in their study grew to within six centimeters of the prediction.
3. Have each student subtract 6 cm from the Box-8 height and write the result in Box 6a. Then have them add 6 cm to the Box-8 height and write the sum in Box 6b. These two figures give the **range** in which each student's adult height will probably fall.
4. Now have each student subtract his present height from both figures (6a and 6b) to find out how much taller he will probably grow. Encourage each student to go to a body-height scale and point to his predicted upper and lower height limits.

DISCUSSING THE RESULTS

1. How does your first prediction (item #1 on the worksheet) compare to the adult height range you just calculated?
2. Do you think your adult height will fall in the lower, middle, or upper part of your predicted range? Why?
3. What kinds of things do you do that might affect how tall you will be? (A balanced diet with enough protein, vitamins, and minerals, plenty of exercise, regular and sufficient sleep, and freedom from disease and drug abuse will maximize a child's growth potential.)

ADDITIONAL CHALLENGES

1. Predict and then use the formula to calculate the probable adult height of a brother, sister, or friend.
2. From school, physician, or home records, find out your height and weight at an earlier age. Use this information to calculate your adult height. How does this prediction compare to the one made from your present size? Note: Be sure to convert your height and weight to centimeters and kilograms, respectively, and to use your age at the time the measurements were made to find the correct multipliers. (One pound = .45 kilograms. Multiply the weight in pounds by .45 to obtain the weight in kilograms.)
3. Write to HAP (c/o Lawrence Hall of Science, University of California, Berkeley, California, 94720) when you reach age 21 and tell us how close the prediction you just calculated is to your real adult height.

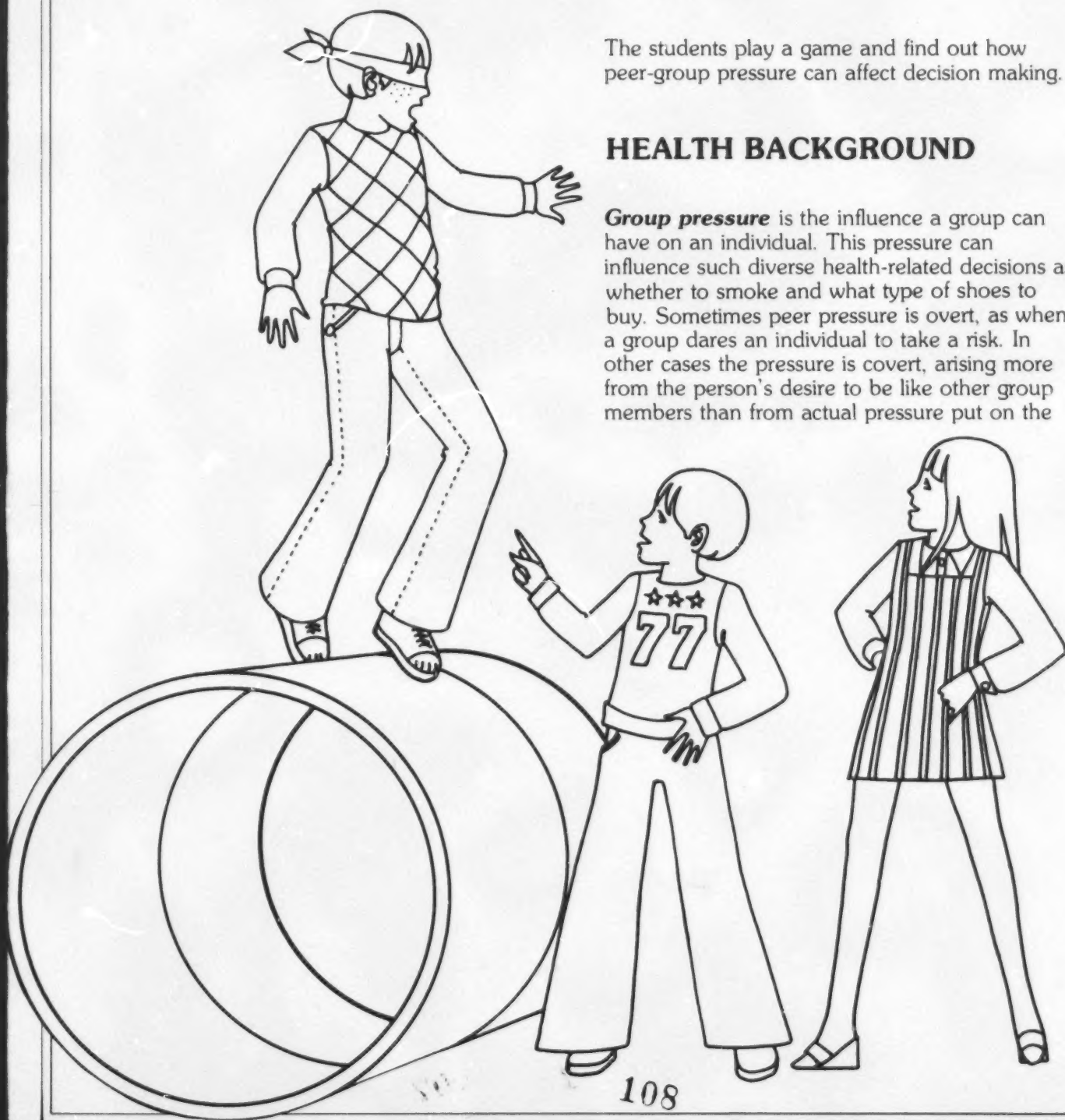
ON THE SPOT

SYNOPSIS

The students play a game and find out how peer-group pressure can affect decision making.

HEALTH BACKGROUND

Group pressure is the influence a group can have on an individual. This pressure can influence such diverse health-related decisions as whether to smoke and what type of shoes to buy. Sometimes peer pressure is overt, as when a group dares an individual to take a risk. In other cases the pressure is covert, arising more from the person's desire to be like other group members than from actual pressure put on the



individual. A student who wants to have the kind of bike her friends have, regardless of its safety record, is being influenced by covert peer pressure. In addition to the direct health risks that arise from giving in to such pressures as to smoke or to take drugs, the inner conflicts that arise when a person is subjected to intense group pressure can also produce headaches, ulcers, high blood pressure, and nervousness.

Group pressure is not always detrimental, however. For instance, current American norms that favor personal cleanliness and weight control can be conducive to sound health practices.

By becoming more aware of how group pressure can influence their decisions, the students are more likely to realize that conforming is not their *only* option. This realization can lead to autonomy and maturity in making choices.

MATERIALS

For each student:

- 1 copy of Student Sheet 2*

For each team of six to eight students:

- 1 spinner card
- 1 copy of Student Sheet 1*

For the class:

- 1 clock with second hand
- 1 duplicator master of Student Sheet 1, "Team Score Sheet"
- 1 duplicator master of Student Sheet 2, "Making Decisions"

*Provided by the teacher

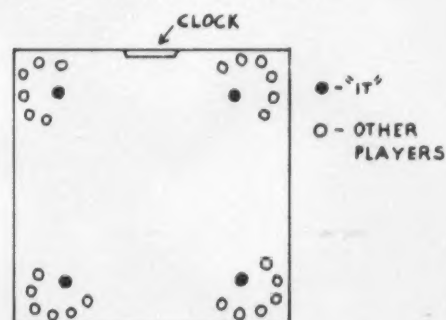
SETTING UP

Scheduling the Activity. The introduction, two rounds of the game, and a brief discussion of the game results require about fifty minutes. Further discussions of group pressure and of the cartoons on Student Sheet 2 require an additional twenty minutes.

Preparing for the Activity

1. Arrange your classroom so that each team of

six to eight has enough room to stand in a semicircle around the person who is *IT*. Each team must be able to see the clock. You may wish to arrange the teams so that each person who is *IT* is visible to everyone, thus increasing the embarrassment potential of the tasks that each student will have to complete.



2. Draw a chart on the chalkboard for recording the team scores.

TEAM NAME	TOTAL FOR ROUND 1	TOTAL FOR ROUND 2	FINAL SCORE

3. Make a copy of Student Sheet 1 for each team, and a copy of Student Sheet 2 for every student.

THE ACTIVITY

Introducing the Activity

1. Introduce the activity as a game of competition between teams. The team whose members cooperate most with each other earns the most points and wins.
2. Show the students how to use the spinner card, explaining that it must rest on a level surface in order for the spinner to spin properly.
3. Explain the game rules to the students.

ON THE SPOT

Student Sheet 1

Team Name _____

TEAM SCORE SHEET

Player's Initials	Points Earned in Round 1	Points Earned in Round 2
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

**Total for
Round 1**

**Total for
Round 2**

Final Score
(Round 1 Total + Round 2 Total)

+

=

Reminder: 1 spin = 5 points

2 spins = 3 points

3 spins = 1 point

Pass = 0 points

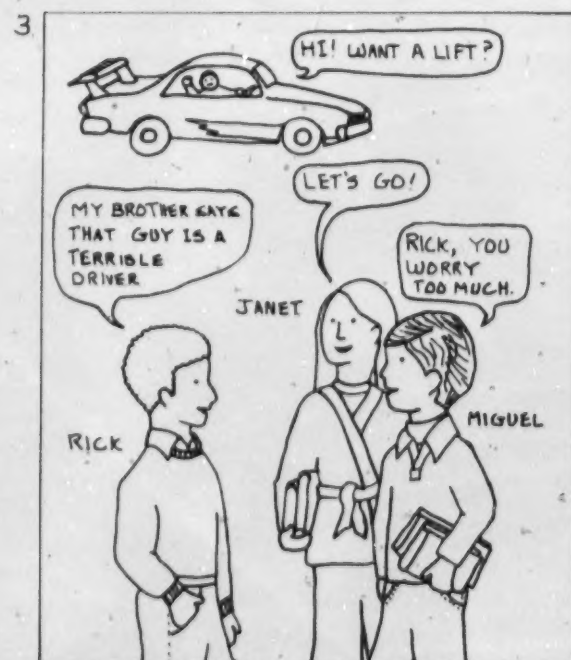
SCOREKEEPER'S DUTIES

1. Time each player's performance for 15 seconds.
2. Record the number of points each player earns.
3. At the end of Round 1, record the team total for Round 1 on the chalkboard.
4. At the end of Round 2, record your team's Round 2 total and the final score on the chalkboard.

ON THE SPOT

Student Sheet 2

MAKING DECISIONS



Game Rules

1. Each member of the team has one turn. When it is your turn:
 - a. Spin the spinner. (If it stops on a line, spin again.)
 - b. Stand up in front of your team, and for fifteen seconds do the assignment the spinner points to. Completing this assignment earns 5 points for your team.
2. If you don't like the first assignment, you can spin again and choose between the original assignment and the new assignment. By spinning a second time, you earn only 3 points, no matter which task you choose. (If you get the same assignment the second time, you can spin again without losing more points.)
3. If you don't like the first two assignments, you can spin a third time and do any one of your three assignments. You earn only 1 point for your team when you take three spins before choosing.
4. If you decide to pass (do none of the assignments), you don't earn any points for your team.
5. You will select one member of your team to be the scorekeeper. The scorekeeper records the number of points earned and makes sure that each team member performs for fifteen seconds.
6. The game consists of two rounds. In each round, every team member takes one turn. At the end of Round 1, each scorekeeper adds up his team's points and records the total on the class chart previously drawn on the chalkboard. At the end of Round 2, the scorekeeper calculates and posts his team's Round 2 score and the final score (the sum of Round 1 and Round 2 scores). The team with the highest total number of points wins the game.

Organizing the Class

1. Form four equal teams of six to eight players. Include boys and girls on each team. If necessary, equalize the number of players on each team by telling the scorekeepers on the larger teams not to take a turn.
2. Distribute a score sheet (Student Sheet 1) to each team, and have each select a scorekeeper and a team name.

3. Have each team go to a different part of the room. The members of each team should sit in a semicircle with the person who is *IT* standing in front of the group.

Playing the Game

1. Give each team a spinner card and let the game begin.
2. At the end of Round 1, interrupt the game to identify each group of students by its team name and announce its score. The reason for the posting and announcing of the scores halfway through the game is to foster competition between the teams and thereby increase group pressure within each team.
3. Start Round 2.
4. Have the scorekeepers record both Round 2 and final scores on the chalkboard. Declare the team with the highest final score the winner.

DISCUSSING THE RESULTS

The Game

1. During the game, which of you did something you didn't especially want to do?
2. What were the most embarrassing assignments?
3. What caused you to do these embarrassing things?
4. Describe some instances in which you wanted to spin again, but didn't. Why didn't you?
5. Were the Round 2 scores higher than the Round 1 scores? If so, why do you think this happened?

Discussing Group Pressure. Introduce and define the term **group pressure** if it has not come up already. (See the **BACKGROUND INFORMATION** section.) Ask your students:

1. When is group pressure harmful?
2. When is group pressure helpful?
3. Identify some different pressure groups that affect you. Which pressure group or groups are you most sensitive to?

Introducing Student Sheet 2. Use this Student Sheet as the focus for further discussion. You might ask these questions for each cartoon:

1. Who is feeling pressure in this cartoon?
2. What is this person trying to decide?
3. Who is putting pressure on him or her?
4. What options are available to the cartoon character? Describe some possible consequences of the character making various choices.

ADDITIONAL CHALLENGES

1. Draw your own cartoon, write a story or comic strip, or put on a skit that shows someone your age who must make a decision in the face of group pressure.
2. For a few days, keep a log in which you record decisions you make. How many are related to health? In which decisions do you think you were affected by group pressure?

RISKY BUSINESS

SYNOPSIS

Risky Business is a board game for three to four players. The students play two games in which they discover how taking risks affects their safety.

HEALTH BACKGROUND

Accidents are the leading cause of death and disabling injuries among young people. These accidents often involve automobiles,

motorcycles, skateboards, bicycles, aquatic recreation, medicines, drugs, and household chemicals. Skateboards alone accounted for over 188,000 injuries in 1976.

Many accidents could be prevented or reduced in severity if more people would exercise control over their own safety. Examples of exercising control include: using safety belts in cars, wearing helmets and protective clothing when riding a motorcycle or skateboard, and following traffic rules. By playing **Risky Business**, the students become more aware of the risks they take and the control they have over their own safety.



MATERIALS

For each student:

- 1 copy of Student Sheets 1, 2, and 3*

For each group of three to four students:

- 1 *Risky Business* game

For the class:

masking or scotch tape*

- 1 duplicator master each of Student Sheets 1 and 2: "Survey on Safety Habits, Part One," and "Survey on Safety Habits, Part 2," and Student Sheet 3, "Scoring the Survey on Safety Habits"

*Provided by the teacher

SETTING UP

Scheduling the Activity. This activity requires two class periods. The best places to break are at the end of the first game or after the students score their safety surveys (Student Sheets 1 and 2).

Preparing for the Activity

1. Tape the game boards on flat surfaces, allowing room for the students to sit around the boards.
2. Make a copy of each Student Sheet for every student.

THE ACTIVITY

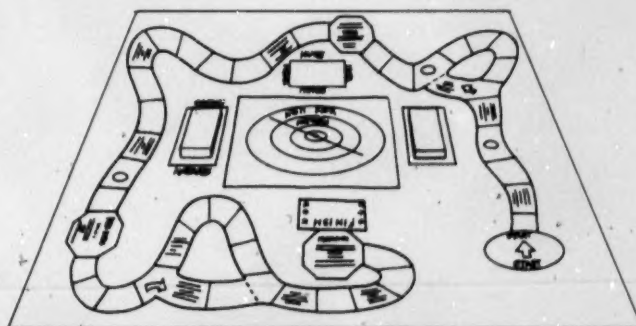
Introducing the Activity. Ask the students to describe safety risks that they take every day. If the students don't understand what you mean by safety risks, offer some examples such as riding without seat belts in a car or teasing a strange dog. Ask the students if they consider themselves to be high, medium, or low safety risks.

Filling out the "Survey on Safety Habits" (Student Sheets 1 and 2). Tell the students that they are each going to fill out a safety survey. Give each student a copy of Student Sheets 1 and 2, and fill out a survey yourself. When

everyone has finished, tell the students that they will score the surveys after playing a game of **Risky Business**. (By filling out the surveys before the game, the students are less likely to be biased in their responses.)

GAME ONE

With the students gathered around one game board, explain the rules for Game One. Make practice moves to illustrate your explanation of the game.



The Set Up

1. The spinner dial is taped to the center of the board. The decks of HAZARD and HURT cards are each shuffled and placed face down in the HAZARD and HURT spaces on the board. The markers are placed beside the board.
2. Each player spins the spinner, reads the number on the outside ring of the dial, and takes a marker according to this scheme:

Highest number = high risk = red marker

Lowest number = low risk = green marker

Middle numbers = medium risk = yellow markers

If there is a tie for highest or lowest number, the players involved spin again to settle the tie. With four players, two will have yellow markers.

2. The players place their markers on START.
3. The high-risk player takes the first turn, with the play moving clockwise around the board (to each player's left).

How to Play Game One

1. Spin the spinner and move your marker forward the number of squares indicated by the spinner. (Read the outside ring of the dial.)

RISKY BUSINESS

Student Sheet 1

Name _____

SURVEY ON SAFETY HABITS, PART ONE

This questionnaire is for your own information only. Answer each question honestly.

Before filling out the survey, complete this sentence:

HIGH

I consider myself to be a **MEDIUM** risk person. (Circle one answer.)

LOW

Now, select the answer that best describes what you do or what you probably would do. Write the letter of your answer in the box next to the question.

☐

1. You get into a car that has seat belts. Do you buckle your seat belt?

A. Seldom or never.
B. About half the time.
C. Almost always.

☐

2. You are standing at a crosswalk and the light says "WAIT."
You don't see any cars coming. What do you do?

A. I usually cross the street anyway.
B. I sometimes cross the street anyway.
C. I usually wait until the light says "WALK."

☐

3. You are playing ball and the ball lands behind a fence. On the fence is a sign that says: "DANGER: KEEP OUT!" You don't see anything dangerous behind the fence. Would you climb the fence and get the ball?

A. Yes.
B. Maybe.
C. No.

☐

4. On the way home from school you find a plastic sandwich bag with candy inside. The candy looks fine and you are really hungry. What would you do?

A. I would eat the candy.
B. I might eat one or two.
C. I would not eat the candy.

RISKY BUSINESS

Student Sheet 2

Name _____

SURVEY ON SAFETY HABITS, PART TWO

Put a check by each statement that usually applies to you.

- _____ 1. I wouldn't go swimming if I were alone, even on a hot day.
- _____ 2. I know the phone number of the fire department (or else the number is attached to the phone).
- _____ 3. I have already figured out the best route from my bedroom to the outside so if the rest of my house were on fire I would be able to escape.
- _____ 4. My family has held a home fire drill.
- _____ 5. I wouldn't ride a bike at night unless it had a working headlight and rear safety reflectors, or I was wearing a portable bike light on my arm.
- _____ 6. I wear safety glasses or goggles whenever there is danger of getting something in my eyes (for example, when I work with chemicals, or when I use a hammer around rocks or concrete).
- _____ 7. When I use paints, glues, or household chemicals such as insecticides or ammonia, I read the safety information on the label and follow what it says.
- _____ 8. I never fool around with matches or anything that is on fire.
- _____ 9. I always make sure my hands are dry before I touch an electric switch.
- _____ 10. Whenever I unplug something, I always pull on the plug, never on the cord.
- _____ 11. When I have to walk in the street, I walk facing the traffic.
- _____ 12. I always carry pencils or scissors with their sharp ends pointing away from my body and down towards the ground.

RISKY BUSINESS

Student Sheet 3

Name _____

SCORING THE SURVEY ON SAFETY HABITS

To find your Risk Rating, score your survey in this way:

1. Look at your answers for Part One.

For every A, give yourself NO points.

For every B, give yourself 1 point.

For every C, give yourself 2 points.

Add your points and write the number in this box.

= points for
Part One

+

2. Look at Part Two.

For every check you made, give yourself 1 point.

Write the number in this box.

= points for
Part Two

3. Add all your points together and write the total in this box.

= **TOTAL POINTS**

4. Find your Risk Rating in the Table below:

RISK RATING TABLE	
Points	Risk Rating
0 to 6 points	High Risk
7 to 14 points	Medium Risk
15 to 20 points	Low Risk

Write your rating in this space.

= **MY RISK RATING**

5. My risk rating was ^{higher than} the same as ^{lower than} my prediction. (Circle one.)

6. Compared with my classmates' ratings, mine was most often ^{higher than} the same as ^{lower than} theirs. (Circle one.)

2. If you land on a **SAFE** or a **BONUS** square, nothing happens. The next player then takes her turn.
3. The squares with arrows are shortcuts. If you land **on** one of these squares, wait there until your next turn. (You must **land** on the square in order to be able to take advantage of the shortcut.) On your next turn, spin the spinner, cross the dotted line, and move the number of squares indicated by the spinner.
4. If you land on a blank square, draw a card from the **HAZARD** deck. Read your **HAZARD** to the other players. Spin again to find out if you got through the hazardous situation safely. Look under the spinner at the dial ring that is the same color (indicating your risk level) as your marker. The answer will be YES or NO. Refer again to your **HAZARD** card. If the outcome is NO, you receive an injury and must take one or more **HURT** cards. If your answer is YES, you are usually safe. Place your **HAZARD** card face up on the pile of **used** **HAZARD** cards. (When all the **HAZARD** cards have been used, shuffle the deck and put it back in the space marked **HAZARDS**.)
5. Whenever you reach a **RECOVERY ZONE** (you don't have to land **on** it), you must stop if you have any **HURTS**. Put one **HURT** back on the **HURT** pile, and wait for your next turn. Each time your turn comes up, give back one **HURT**. You cannot leave the **RECOVERY ZONE** until all your **HURTS** are gone. If you don't have any **HURTS**, you can pass right through the **RECOVERY ZONE** without stopping. If you **land** on a **RECOVERY ZONE** and you have no **HURTS**, treat it as a **SAFE** square.

Who Wins?

1. The first person to reach **FINISH** is the winner.
2. After someone wins, each of the other players moves backwards three spaces for every **HURT** he or she has.
3. The player closest to **FINISH** comes in second, the next player is third, etc.

Playing Game One. After explaining the rules for Game One, give each of the groups one set of game materials, and let them begin. Circulate between the groups and lend assistance when needed.

Discussing Game One. After the first game, ask the students what they learned from the game. Were low-risk or high-risk players more successful? Which players seemed to get "hurt" most often?

SCORING THE SAFETY SURVEYS

Distribute copies of Student Sheet 3 and let the students score their own surveys. After the risk ratings have been determined, find out how many students had risk ratings of high, medium, and low. How many students found that their scored ratings matched the ratings they gave themselves before they filled out the surveys? Ask the students how they feel about their risk ratings after playing Game One.



GAME TWO

Outline the rule changes for the second game, and let the groups begin.

How to Play Game Two

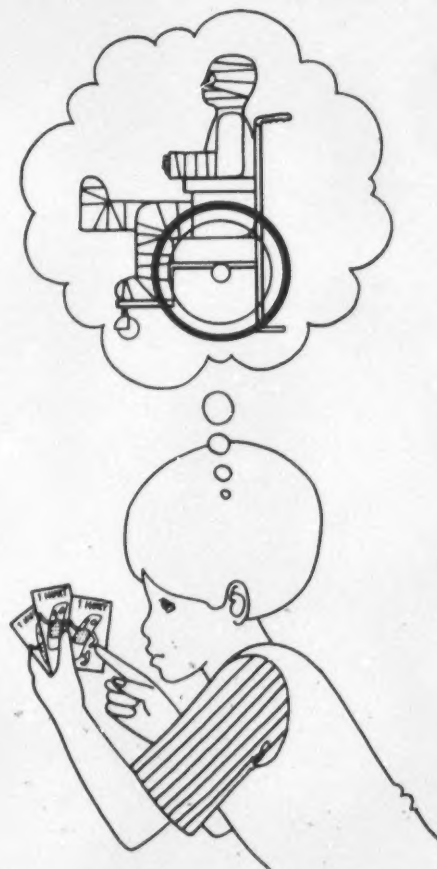
1. In Game Two the players choose the level of risk they want to take on each move, i.e. they can make a low-risk move on one turn and a high risk move on the next turn, and so on.
2. There are **no** SAFE squares, **no** BONUS squares, and **no** shortcuts. The RECOVERY ZONE, however remains the same. If you pass through the zone and have HURTS, you must stop and give up one HURT per turn until all your HURTS are gone.
3. When it is your turn, pick up a HAZARD card, read it aloud, and then decide if you want to make a high, medium, or low-risk move.

Move:

- 3 spaces if you choose low risk.
- 4 spaces if you choose medium risk.
- 5 spaces if you choose high risk.

(In this game, the spinner is not used for determining the number of spaces to move.) After moving your marker, spin to find out how you came through the hazard.

4. All other rules of the game remain the same.



GAME THREE (optional)

Follow the rules for Game One, excluding the initial spin to determine your risk rating. Play with risk markers that match your risk rating from the safety survey. You may need to initial your marker to distinguish it from others of the same color.

DISCUSSING THE GAMES

1. What did you learn about safety from playing the games?
2. What did the games suggest about people who don't exercise control over their safety?
3. Why don't you always choose the safest course of action? Are there any times when you would want to take a high risk? What are these times?
4. Why do you think people continue to take risks such as not wearing seat belts?

CONSUMERS' CHOICE

SYNOPSIS

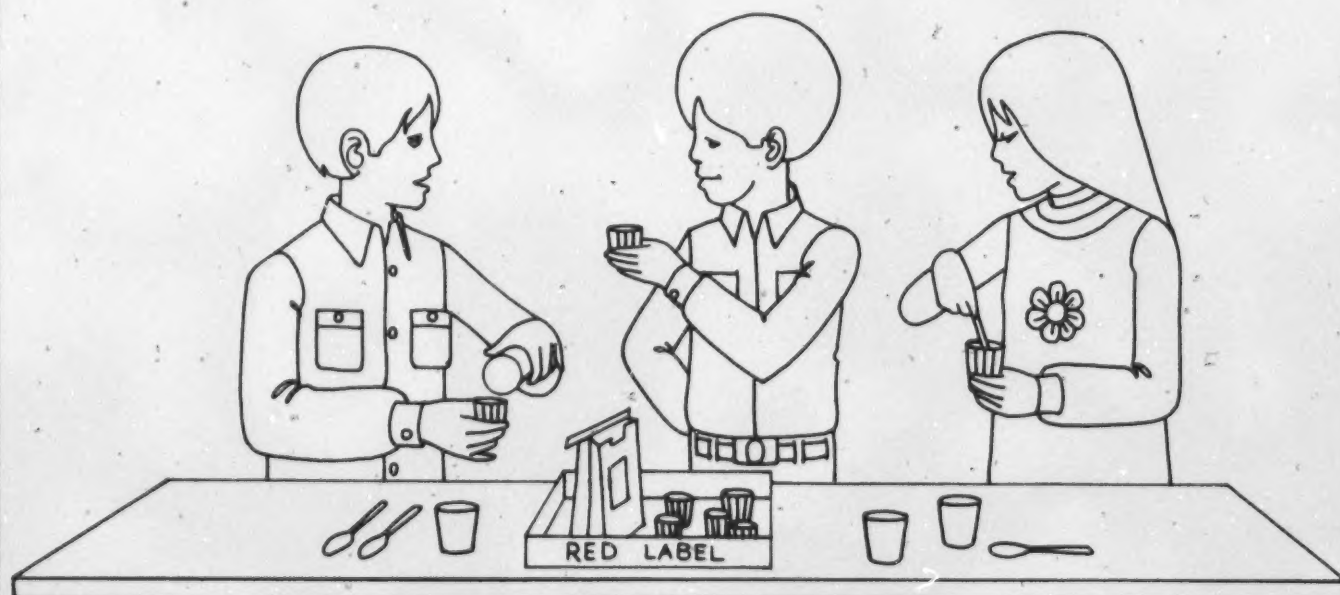
By comparing and rating two samples of cocoa (identical in content but with different descriptions of the ingredients), the students discover how preconceptions often influence judgments.

HEALTH BACKGROUND

Selecting foods is one of many health-related decisions that contain an element of subjective judgment. A person's expectations often influence these subjective judgments. For example, someone who believes that vitamin supplements will give her more energy may feel more energetic after taking them even if her diet were already sufficient in vitamins.

For this reason, studies that evaluate medical treatments must be **double blind**. The patient must not know whether he is getting the new treatment or a "treatment" that has no actual effect. Such a "treatment" is called a placebo. In addition, the investigator who evaluates the patient's condition after treatment must have no knowledge of which treatment the patient received. These double-blind experiments are used to avoid biasing test results. The patient cannot change his behavior, consciously or subconsciously, to meet his expectations for the effect of the treatment. Likewise, the evaluator has no expectations that could cause her to jump to conclusions or see correlations that do not exist.

Making rational decisions in daily life is essential for maintaining health. By becoming more aware of how expectations often influence judgments, the students might improve their ability to base decisions on concrete evidence and sound reasoning.



MATERIALS

For each student:

- 2 three-ounce paper cups
- 2 flat toothpicks
- 1 copy each of Student Sheets 1 and 2*

For the class:

- 1 package of Red Label cocoa**
- 1 package of Blue Ribbon cocoa**
- 2 teaspoons
- 8 foam cups
- 2 broad-tipped felt pens (one red and one blue)
- hot tap water*
- 4 tacks or masking tape*
- 2 or more trays or flat boxes* (for holding paper cups)
- sponge or paper towels* (for cleaning up any spills)
- sink or waste container* (for disposing of leftover liquid cocoa)
- 1 duplicator master of Student Sheet 1, "Rating the Cocoas"
- 1 duplicator master of Student Sheet 2, "Looking at Expectations"

* Provided by the teacher

** These two packages contain the same cocoa, despite their different labels. **DO NOT TELL THE STUDENTS THAT THE TWO COCOAS ARE THE SAME.**

Preparing for the Activity

1. Make a copy of each Student Sheet for every student. (Student Sheet 2 is optional; see the **ADDITIONAL CHALLENGES** section.)
2. Make a large red X on half of the cups (which will now be called red cups) and a large blue X on the remaining cups (which will now be called blue cups).
3. Set the red cups on one tray and the blue cups on the other tray. In full view of the class, place one heaping teaspoonful of Red Label cocoa in each red cup and one heaping teaspoonful of Blue Ribbon cocoa in each blue cup. Put one toothpick (stirrer) in each cup. (You may want to enlist the students' help in this preparation.)
4. Locate or provide a hot-water source for the activity. **Hot** tap water is sufficient. While the children are testing the dry Red Label cocoa, you can fill the eight foam cups with hot water. Be sure to use only one source for hot water; a change in temperature may result in a change in taste.
5. Reproduce this chart on the chalkboard. When you poll the students as to the brand of cocoa they prefer, record the results on the chart.

WHICH BRAND IS BEST?

RED LABEL	BLUE RIBBON

SETTING UP

Scheduling the Activity. Introducing the activity and rating the cocoas takes about twenty minutes. The discussion, which should immediately follow the rating activity, requires ten minutes or more.

CONSUMERS' CHOICE

Student Sheet 1

Name _____

RATING THE COCOAS



INGREDIENTS:

EXTRACTED SUCROSE,
COCOA PROCESSED IN ALKALI,
UNCOAGULATED MILK PARTS,
PARTIALLY SEPARATED MILK,
SODIUM CHLORIDE,
ARTIFICIAL FLAVORING.

Circle the number that best represents your opinion.

The Dry Mix	Excellent	Good	Fair	Poor
Aroma	4	3	2	1
Appearance	4	3	2	1
Flavor	4	3	2	1
Mixed with water	Excellent	Good	Fair	Poor
Aroma	4	3	2	1
Appearance	4	3	2	1
Flavor	4	3	2	1

To find the total, add all the numbers you circled.

TOTAL POINTS =



INGREDIENTS:

PURE SUGAR,
RICH DUTCHED CHOCOLATE,
WHEY, NON-FAT MILK,
SALT, VANILLIN.

Circle the number that best represents your opinion.

The Dry Mix	Excellent	Good	Fair	Poor
Aroma	4	3	2	1
Appearance	4	3	2	1
Flavor	4	3	2	1
Mixed with water	Excellent	Good	Fair	Poor
Aroma	4	3	2	1
Appearance	4	3	2	1
Flavor	4	3	2	1

To find the total, add all the numbers you circled.

TOTAL POINTS =

WHICH BRAND EARNED THE HIGHER RATING?

123

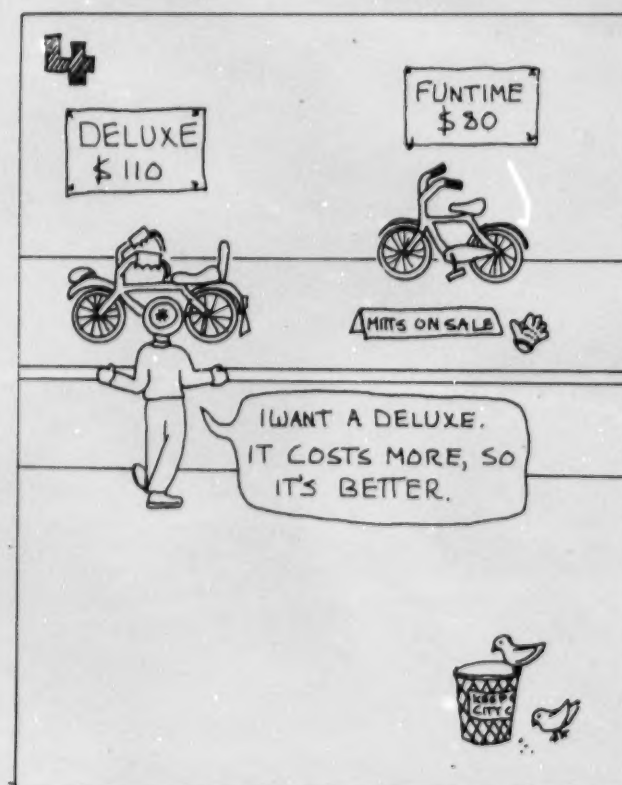
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124

CONSUMERS' CHOICE

Student Sheet 2

LOOKING AT EXPECTATIONS



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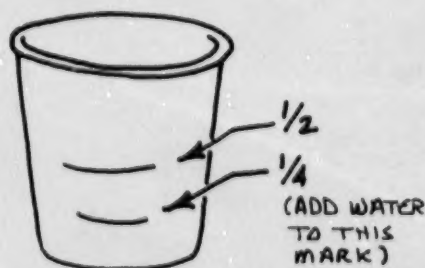
THE ACTIVITY

Introducing the Activity. Ask the students how they would choose between two different brands of the same kind of food. Give them ample time to consider the question and to respond. You may want to start the discussion by asking the students to compare two different brands of hamburgers popular in your area. (Size, taste, cost, or greasiness are just a few comparisons that the students usually make.)

Explain to the students that in this activity they will be rating two different brands of cocoa on their appearance, aroma, and flavor. Introduce the two brands, Red Label and Blue Ribbon, pointing out that they come in red cups and blue cups, respectively. Read **aloud** the ingredients of each brand (listed on Student Sheet 1). This oral reading insures that the students are aware of the "difference" in ingredients and thus may form different expectations about the taste of the two brands.

Instructions for Rating the Cocoas

1. Distribute copies of Student Sheet 1 and give the following directions:
 - a. The ingredients for each brand are listed on the Student Sheet.
 - b. Rate the dry powder before adding any water.
 - c. Add water to fill the cup only one-quarter full. The best way to do this is to make a pencil mark on the cup halfway from the bottom and then another mark halfway between the first mark and the bottom. The liquid cocoa should reach this lower mark.



2. Tell the students that they should each rate the cocoa individually. They should keep their reactions to themselves to avoid influencing the judgments of others.

3. Distribute or have the students pick up the cups of Red Label cocoa mix. While the students rate the dry powder, fill the eight foam cups with water from your hot-water source. After the students have rated the dry Red Label cocoa, tell them to add the hot water, **stir the cocoa well**, and rate the liquid cocoa.

4. If the students are concerned that the taste of Red Label cocoa in their mouths will influence their rating of the Blue Ribbon cocoa, suggest that they rinse their mouths out with water if it is convenient.

5. Repeat Step 3, this time with the Blue Ribbon cocoa.

Recording the Results. Have the students record their personal ratings for each brand on their Student Sheets. Poll the students as to which brand they like the best. Record the results in the chart on the chalkboard. If anyone rates the two brands the same, add a column titled "Ties" to the right of the existing columns on the chart. **Do not add this column before polling the students.**

WHICH BRAND IS BEST?

RED LABEL	BLUE RIBBON	TIES

Blindfolded Taste Test. After the students have decided which cocoa they prefer (and before you conduct the discussion), you might want to conduct a blindfolded taste test. Ask five or six children to taste the cocoa while blindfolded and to state their preference. Have the group discuss the results of these tests before proceeding with the rest of the discussion.

DISCUSSING THE RESULTS

1. What do our results suggest?
2. Which brand do you think most people would decide to buy?
3. Why do you think one brand was rated higher than the other?
4. **Revealing the Hidden Information.** Tell the students that you were conducting a special kind of taste test: the two brands are actually the same kind of cocoa, but packed in containers with different labels. The ingredients are **exactly the same**, but one list describes them in appetizing terms while the other uses unappetizing or scientific words. Continue with such questions as:
 - a. What made you think that the two samples of the same cocoa tasted, looked, or smelled different?"
 - b. After the students have discussed how they were led by the different **descriptions** of the ingredients to expect different tastes and aromas, ask for examples of other ways that expectations can be created.
 - c. Now that you know how expectations can influence our judgments, what kinds of things could have made the cocoas **actually** taste different? (Help the students identify different experimental errors, e.g. different water levels, different water temperatures, taste buds not as sensitive, etc.)

ADDITIONAL CHALLENGES

1. The cartoons on Student Sheet 2 show examples of how expectations can influence health-related decisions. You might initiate the discussion by asking questions such as:
 - a. What decision is being made in this cartoon?
 - b. What is the expectation?
 - c. What created the expectation?The students might enjoy creating their own cartoons or stories illustrating instances where judgments are influenced by expectations.
2. **Take-Home Challenge.** Have the students conduct a taste test with their brothers, sisters, parents, or friends on any two brands of a food they have at home. Have them share their results with the class.

MAP YOUR TEMPERATURE

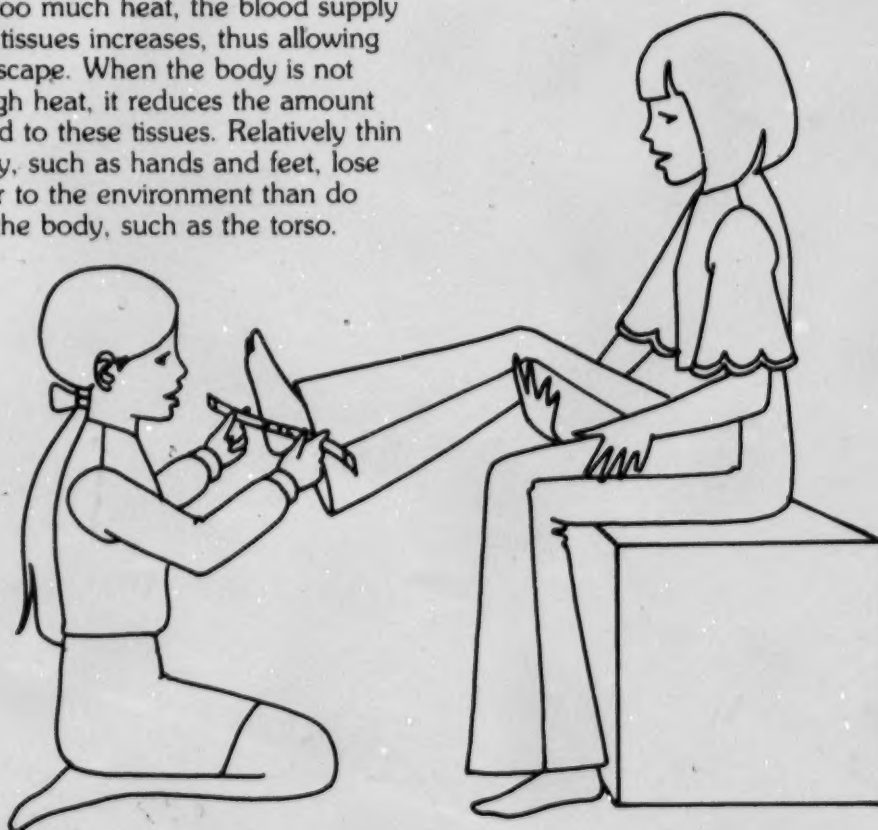
SYNOPSIS

The students discover that different parts of their bodies have different skin temperatures.

HEALTH BACKGROUND

The human body produces heat in order to maintain the relatively constant internal temperature that is necessary to support life. This heat is regulated by the steady stream of blood coursing throughout the body. By increasing or decreasing the blood supply to tissues just beneath the skin, the body maintains the necessary internal temperature. When the body produces too much heat, the blood supply to these surface tissues increases, thus allowing excess heat to escape. When the body is not producing enough heat, it reduces the amount of blood supplied to these tissues. Relatively thin parts of the body, such as hands and feet, lose heat much faster to the environment than do thicker parts of the body, such as the torso.

Skin temperatures can indicate problems the body is having maintaining constant internal temperatures. For example, someone with a fever feels warm to the touch because the blood circulation close to the skin surface is at a maximum. Someone in shock feels cold to the touch because the surface blood has been reduced to a minimum.



MATERIALS

For each student:

- 1 copy of the Student Sheet*

For the class:

- 32 HAP strip thermometers
- 1 "Using the HAP Strip Thermometer" Technique Card
- liquid chlorine bleach*
- cotton*
- 1 duplicator master of the Student Sheet, "Map Your Temperature"

*Provided by the teacher

SETTING UP

Scheduling the Activity. This activity requires one fifty- to sixty-minute class period. **Map Your Temperature** introduces the students to the HAP strip thermometer and should precede the other skin temperature activities (**Out in the Cold** and **The Great Heat Escape**).

Preparing for the Activity

1. Familiarize yourself with the HAP strip thermometer by reading the "Using the HAP Strip Thermometer" Technique Card.
2. Sterilize each strip thermometer by wiping both sides with a weak, laundry-bleach solution as described on the Technique Card.
3. Make a copy of the Student Sheet for every student.

THE ACTIVITY

Introducing the Activity. Ask the students what they think their "normal" internal body temperature is in degrees Celsius (centigrade). You may have to tell them that the normal temperature is 37°C (98.6°F). Ask them if they think that the outside surface of their bodies is the same temperature as the inside. Are all parts of the skin the same temperature? If they have trouble answering this last question, suggest that they touch the back of their hands to their necks

and foreheads. Do they feel any difference? Tell the students that today they are going to find the temperatures of different parts of their bodies.

Predicting Hot Spots and Cold Spots. Give each of the students a Student Sheet, and ask them to predict which part of their skin will be the hottest. Have them mark this spot on their body maps. (Instructions for marking appear on the Student Sheet.) Encourage them to touch the back of their hands to different body parts to help them make predictions. Then have them predict which spot on their bodies will be the coldest and mark that spot. After they predict the hottest and coldest spots, ask them to predict the temperature at each of those spots.



Introducing the HAP Strip Thermometer

1. After the students have completed their predictions, show them the HAP strip thermometer. Tell them that it is a new kind of thermometer designed to measure skin temperatures on different parts of the body.
2. Hold up a strip thermometer, and point out the number that is visible. Ask the students what they think the number indicates (the temperature of the air).
3. Divide the class into pairs and give each student one strip. Tell the students that you will give them two to three minutes to experiment with the strips by taking temperature readings of their hands. *Caution them not to put the strips in their mouths.*

MAP YOUR TEMPERATURE

Student Sheet

Name _____

MAP YOUR TEMPERATURE

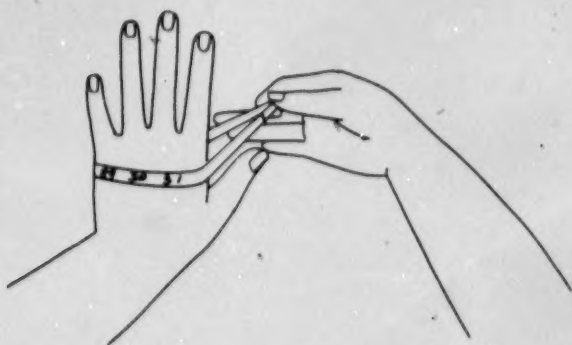
1. Record your predictions on the figure below:
 - a. Write **"HOTTEST"** on the spot that you think is the hottest spot on your body, and circle that area.
 - b. Write **"COLDEST"** on the spot that you think is the coldest spot on your body, and circle that area.
 - c. In each circle, write the temperature that you think each of these spots will have.
2. Now measure 10 parts of your body with a HAP strip thermometer to test your predictions. Record each temperature on the appropriate part of this figure.



USING THE HAP STRIP THERMOMETER

Technique Card

5. **The Loop Technique.** This technique is useful when you can use only one hand to hold the strip thermometer, e.g. when you are measuring the temperature of the back of one hand, the forearm, etc. Form a loop with the strip thermometer by holding the orange end tabs together with one hand. (The shiny side of the strip should be on the outside of the loop.) Insert your arm, foot, or leg through the loop. The loop should fit tightly against the part of the skin being measured.



Care of the Thermometers

1. To prolong the life of the strip thermometers, do not expose them to direct sunlight, extremely high temperatures, or rapid temperature changes outside of the range of the thermometer. The strips can withstand freezing, but should be warmed up slowly. The optimum storage temperature for these strip thermometers is between 13°C and 37°C.

2. Brief exposure to cold water will not harm the strip thermometers, but *do not* soak them in water or put them in warm water.

3. Do not put tape on the back of the strips as the tape markedly decreases the sensitivity of the strips. In addition, any attempt to pull the tape off will loosen the crystals and destroy their usefulness. If, however, the orange ends of the strips become loose, a little transparent tape will repair them. *Do not* bend the strips or scrape the back sides; such treatment loosens and destroys the crystals.

Sterilizing the Strip Thermometers

1. Sterilize the strip thermometers before each use.

2. To make the disinfectant, add ¼ capful of chlorine bleach to eight ounces of cold water.

3. Dip a cotton pad into the disinfectant and wipe both sides of the strips.

4. Rinse the strips by wiping them with a clean cotton pad that has been dipped in clear water.

5. Dry the strips and lay them out (shiny side down) on dry paper towels. Stacking the strips or storing them before they are thoroughly dry causes the strips to stick together. *Do not* use solvents such as alcohol or acetone; they will destroy the strips.



**Map Your Temperature
Out in the Cold
The Great Heat Escape**

**USING THE HAP STRIP
THERMOMETER**

Technique Card

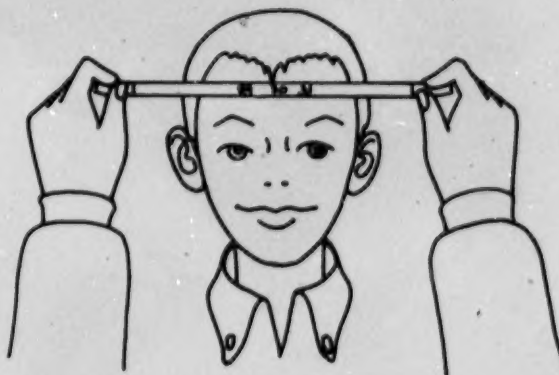
How It Works

The HAP strip thermometer is made up of a series of encapsulated liquid crystals, each of which is optically active within a one-degree Celsius range; i.e. they go through visible color changes only within that specific range. The different crystals are encapsulated behind the strip numerals that indicate the particular one-degree ranges. As you hold the strip against an object, the numerals sequentially light up until the temperature indicated corresponds to the object's temperature. The actual temperature of the object is the highest numeral lit that does not change color for at least ten seconds.

The different color changes that each numeral goes through reflect fractions of a degree. The crystals behind a numeral change from black to tan to green-blue to violet-blue. If a numeral stays tan colored for at least ten seconds, the exact value of the numeral (e.g. 26) is the temperature of the object. Green-blue indicates a half degree more (e.g. 26.5). The violet-blue indicates that the next temperature (27) is almost reached. The next Celsius degree is reached when this next number turns tan. As various temperatures are passed, the numerals remain violet blue.

Suggested Procedure

1. Work in pairs.
2. Using both hands, hold the strip by the orange tabs.

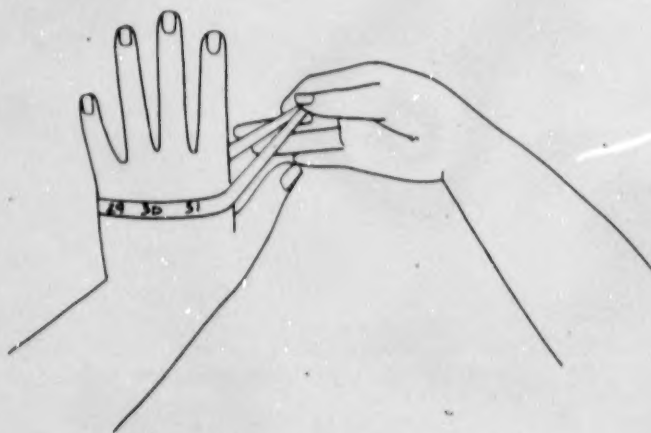


3. Press the strip, shiny side up, tightly against the surface of the object to be measured. (**Note:** Breathing on or touching the black portion of the strip will alter the temperature readings.)
4. As the numerals light up, slide the strip in one direction or the other so that the numeral currently lit is on the spot that you are measuring. Hold the strip firmly against the surface of the object until the highest numeral lit remains one color for at least ten seconds.

4. After the discovery period, ask your students to describe the various color changes the strips went through. (While you are gathering this information, use the information on the "Using the HAP Strip Thermometer" Technique Card to help the students understand that the color changes indicate variations in temperature within fractions of a degree.) How do they know when the strip is indicating the proper temperature? How do they know that the temperature reading will not rise more? Make sure the children understand the color-change differences within a number so that they can indicate half degrees.

5. Ask the students why it is important to hold the strip by the orange end tabs rather than in the center. Why is it important to avoid breathing directly on the strips?

6. Make sure the students realize how long they must wait and what sign they must wait for before they record a temperature (at least five seconds on one number and in one color). If the children had difficulty holding the strip tightly against their hands, suggest that they hold the orange ends together to form a loop and slip this loop over their hands.



7. Take a temperature reading of a student's forehead to show the students how to make measurements when a partner's help is needed. Encourage the students to work in pairs as they record temperatures of different parts of their bodies.

Doing the Activity

1. Challenge the students to test their predictions by taking temperature readings on at least ten different parts of their bodies. Remind them to take readings of their predicted hot and cold spots.



2. Encourage the students to take readings of their feet, backs of knees, backs, bellies, tops of ears, and other spots.

3. Continually challenge them to find hotter or colder spots than those already measured.

DISCUSSING SKIN TEMPERATURE

1. What was the hottest spot you measured on your body? The coldest?
2. Are the hottest and coldest spots the same for everybody? (Poll the students for the two or three hottest and coldest spots, and put the results on the board.)
3. How many of you actually predicted your hottest and coldest spots? Where were they?
4. Where do you think the body heat comes from?
5. Why do you think different parts of the body are colder (or hotter) than other parts?
6. Describe situations in which skin temperature on various parts of your body could inform you of possible problems (sunburn, fever, headache, stomach ache, bruised muscle, shock, fainting).

TAKE-HOME CHALLENGES

1. Remind the students that the normal internal temperature is 37°C or 98.6°F. Since many students have had their temperatures taken only while they were sick, they may not have known their normal temperature. Invite them to take their oral temperature with a bulb thermometer at home and bring in the results. These results will open the door for a discussion of the fact that many individuals actually have an internal temperature slightly higher or lower than the "average" internal temperature. If students don't know how to use a bulb thermometer or don't have one at home, borrow some from the school nurse and spend some time during another class period to teach them how to use it and to gather the data.

2. Challenge the students to take their internal temperature with a bulb thermometer when they get up in the morning and just before they go to bed. Is there a difference? What might explain any difference?

OUT IN THE COLD

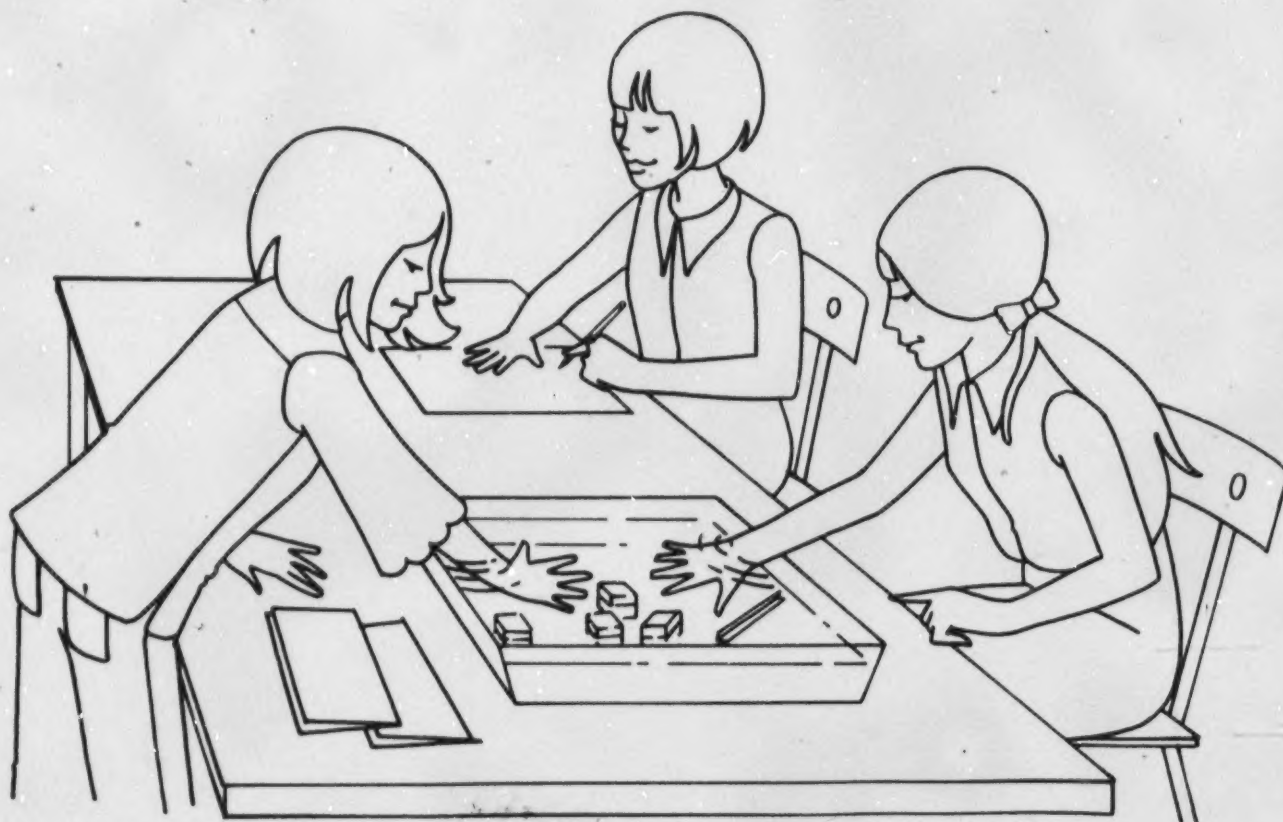
SYNOPSIS

By measuring the temperature response of their hands to cold, the students discover their cold recovery rates and patterns.

HEALTH BACKGROUND

Our responses to heat and cold are forms of body temperature regulation. By balancing heat production and heat loss, our bodies regulate their temperatures.

Skiing, cold rainy weather, and playing in the snow present the body with the problem of cold recovery. In these situations, the body maintains the temperature range necessary for proper functioning by increasing heat production and/or decreasing heat loss. The speed with which the body warms back up after exposure to cold depends on dress, heart rate, and physical conditioning. Biological activities that increase heat production include exercise, shivering, and the way our bodies process food. Heat loss is reduced with a decrease of the blood flow to the extremities (hands and feet). By experiencing their responses to cold exposure, the students become aware of their own temperature controls.



MATERIALS

For each student:

- 1 HAP strip thermometer
- 1 copy of the Student Sheet*

For the Class:

- 3 plastic trays for water baths
- 3 Celsius bulb thermometers
- ice cubes*
- water*
- liquid chlorine bleach*
- paper towels*
- cotton*
- 1 "Using the HAP Strip Thermometer" Technique Card
- 1 duplicator master of the Student Sheet, "Temperature Record Sheet"

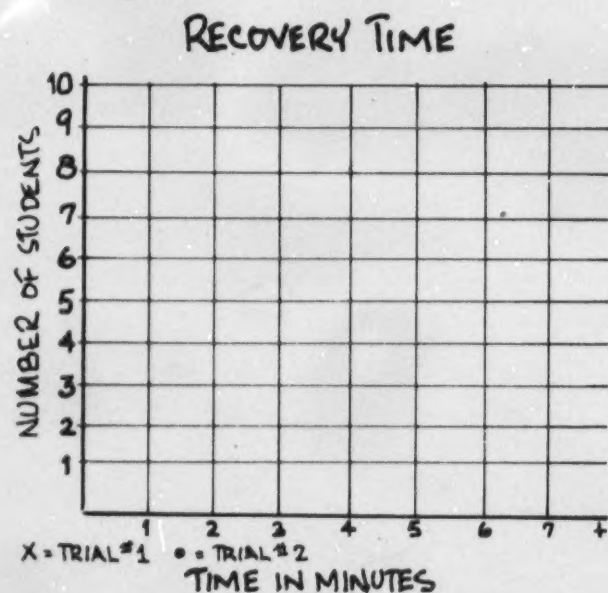
*Provided by the teacher

SETTING UP

Scheduling the Activity. This activity should follow **Map Your Temperature**. Allow approximately sixty minutes for **Out in the Cold**.

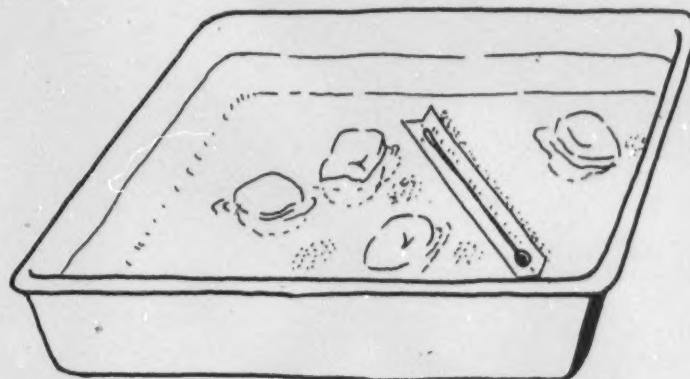
Preparing for the Activity

1. Make a copy of the Student Sheet for every student.
2. Draw a histogram on the chalkboard labeled "Recovery Time."



3. Sterilize each strip thermometer by wiping both sides with a weak, laundry-bleach solution. (See the Technique Card.)

4. Place the three trays in three different parts of the room. Fill each tray half full with cold water and place the bulb thermometer face up in each tray of water. Add a capful of bleach to each tray to act as a disinfectant. Place towels within easy reach of each tray.



5. Five minutes before you start the activity, add enough ice cubes to the water to lower the water temperature to between 10° and 12° C (approximately one part ice to six parts water). Maintain a constant water temperature (10° to 12° C) throughout the activity by adding more ice as needed.

THE ACTIVITY

Introducing the Activity. Explain to the students that they are going to investigate the effects of cold on their bodies. Ask the students to describe personal experiences with cold. What parts of their bodies felt cold first? Ask them what they think happens to their skin temperature when they get cold.

Trial One: Unassisted Cold Recovery

Introducing Trial One. Tell the students that first they are going to time their reaction to cold. They will take the temperature of their hands, place their hands in cold water, and then find out what happens to their skin temperature after their hands are removed from the cold.

OUT IN THE COLD

Student Sheet

Name _____

TEMPERATURE RECORD SHEET



X = Trial 1
O = Trial 2



	Temperature of water bath	Hand temperature before the bath	Immediately out of bath	After 1st minute	After 2nd minute	After 3rd minute	After 4th minute	After 5th minute	After 6th minute	After 7+ minutes
Trial #1	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
Trial #2	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C

How did you change your recovery time in Trial 2? _____

**Map Your Temperature
Out in the Cold
The Great Heat Escape**

**USING THE HAP STRIP
THERMOMETER**

Technique Card

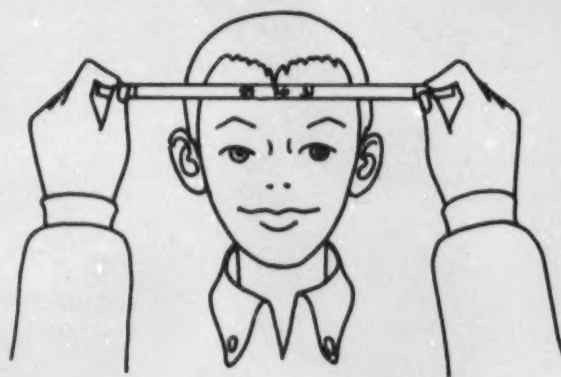
How It Works

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The different color changes that each numeral goes through reflect fractions of a degree. The crystals behind a numeral change from black to tan to green-blue to violet-blue. If a numeral stays tan colored for at least ten seconds, the exact value of the numeral (e.g. 26) is the temperature of the object. Green-blue indicates a half degree more (e.g. 26.5). The violet-blue indicates that the next temperature (27) is almost reached. The next Celsius degree is reached when this next number turns tan. As various temperatures are passed, the numerals remain violet blue.

Suggested Procedure

1. Work in pairs.
2. Using both hands, hold the strip by the orange tabs.

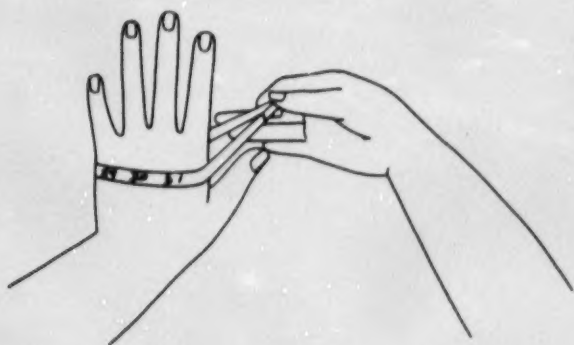


3. Press the strip, shiny side up, tightly against the surface of the object to be measured. (**Note:** Breathing on or touching the black portion of the strip will alter the temperature readings.)
4. As the numerals light up, slide the strip in one direction or the other so that the numeral currently lit is on the spot that you are measuring. Hold the strip firmly against the surface of the object until the highest numeral lit remains one color for at least ten seconds.

USING THE HAP STRIP THERMOMETER

Technique Card

5. The Loop Technique. This technique is useful when you can use only one hand to hold the strip thermometer, e.g. when you are measuring the temperature of the back of one hand, the forearm, etc. Form a loop with the strip thermometer by holding the orange end tabs together with one hand. (The shiny side of the strip should be on the outside of the loop.) Insert your arm, foot, or leg through the loop. The loop should fit tightly against the part of the skin being measured.



Care of the Thermometers

1. To prolong the life of the strip thermometers, do not expose them to direct sunlight, extremely high temperatures, or rapid temperature changes outside of the range of the thermometer. The strips can withstand freezing, but should be warmed up slowly. The optimum storage temperature for these strip thermometers is between 13°C and 37°C.

2. Brief exposure to cold water will not harm the strip thermometers, but *do not* soak them in water or put them in warm water.

3. Do not put tape on the back of the strips as the tape markedly decreases the sensitivity of the strips. In addition, any attempt to pull the tape off will loosen the crystals and destroy their usefulness. If, however, the orange ends of the strips become loose, a little transparent tape will repair them. *Do not* bend the strips or scrape the back sides; such treatment loosens and destroys the crystals.

Sterilizing the Strip Thermometers

1. Sterilize the strip thermometers before each use.

2. To make the disinfectant, add ¼ capful of chlorine bleach to eight ounces of cold water.

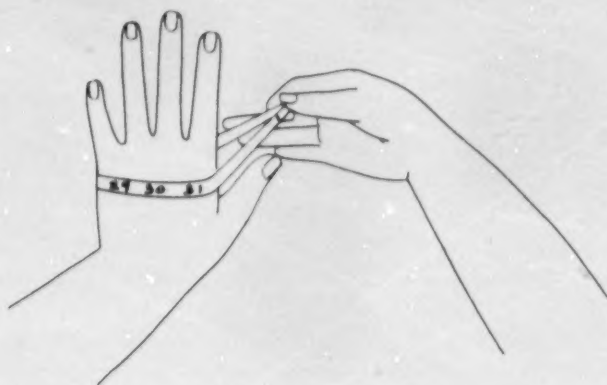
3. Dip a cotton pad into the disinfectant and wipe both sides of the strips.

4. Rinse the strips by wiping them with a clean cotton pad that has been dipped in clear water.

5. Dry the strips and lay them out (shiny side down) on dry paper towels. Stacking the strips or storing them before they are thoroughly dry causes the strips to stick together. *Do not* use solvents such as alcohol or acetone; they will destroy the strips.



1. Briefly review the use of the HAP strip thermometers. Make sure the students can use the loop technique: The looped strip should pass between the thumb and the index finger with the strip fitting snugly across the back of the hand. (See the Technique Card.)



2. Distribute the Student Sheets and point out the boxes for recording the results.

Demonstrating the Procedure

1. Measure the temperature of the back of your hand with the HAP strip thermometer. Show the students where on the Student Sheets to record their before-the-bath hand temperatures.

2. Go to one of the water baths, and show the students how to read (from the bulb thermometer) the temperature of the water and where to record this temperature on the Student Sheet.

3. Immerse your hand in the water for thirty seconds. Tell the students to note that you are not moving your hand or dipping it in and out of the water. Explain to the students that such movements would change the skin's response rate.

4. After thirty seconds, remove your hand from the water, dry your hand, and immediately take the skin temperature with the strip thermometer. Explain to the students that they will be leaving their strip thermometers at their desks while working at the baths. They can gently blot or dry their hands as they walk back to their seats so that when they reach their seats they can immediately measure and record their temperatures. (Warn the students that rubbing

their hands vigorously with the towel will increase their skin temperature.) Show the students where to record this temperature on the Student Sheet.

5. **The Timing Procedure.** Demonstrate the timing procedure by taking the first-minute reading. Count out loud from one to sixty. Then take fifteen seconds (counting out loud from one to fifteen) to establish the temperature reading and record it. Explain to the students that after taking the reading, they should again repeat the sixty-second count and the fifteen-second count. Tell them that they will be repeating this procedure seven times. Each sixty-second count represents a minute interval. During each fifteen-second count, the students will be measuring and recording a temperature reading. Explain to the students that timing should be continuous and silent; the students should count the seconds to themselves.

6. Practice the timing procedure with the class until most of the class is measuring and reporting temperatures at the same pace.

Doing the Activity

1. Give each student a HAP strip thermometer.

2. Ask them to follow the procedures you just outlined. Tell them to repeat the timing procedure for at least seven times.

3. **Graphing the Results.** After the students have finished recording their seven readings, have them transfer their data to the graph by making an X in each sixty-second time-interval column at the appropriate temperature reading for that time period.

a. Next, have the students connect their X's with a line to produce their individual recovery patterns. Explain that **recovery time**, in this case, is the time it takes for the hand temperature to return to its before-the-bath temperature.

b. Have the students draw a horizontal line across their graphs indicating their before-the-bath skin temperatures.

Discussing Trial One. The following questions are designed to bring out two points: (1) Cold exposure can be painful and uncomfortable; (2) After exposure to the cold, the skin returns to its before-cold-exposure temperature.

1. How did your hand feel when it was exposed to the cold?
2. What did the bath do to your skin temperature? What happened to your skin temperature after you took your hand out of the bath?
3. What might happen if you were exposed to cold for a long time?
4. What other parts of your body could you use to warm up your hands when they get cold? Why?

Trial Two: Changing Your Recovery Time

Earlier, the students described situations in which they were cold. Ask them now to describe ways to speed up the recovery rate of their hands when they are cold. Point out the boxes for Trial Two on the Student Sheet. Explain to the students that they are going to try to find a way to change their recovery time after taking their hands out of the water. Ask the students to describe and share methods they might use to get warm. (Possible techniques include: rubbing, breathing on the hand, wrapping the hand with clothes, positioning the hand under the armpit or on the stomach.)

1. Challenge each of the students to select one method they think will speed up the warming of their hands. Ask them to repeat the Trial-One procedure, with this change: Each student will use his or her chosen warm-up technique during each sixty-second count.
2. Remind the students not to move their hands while in the water and to count, time, and record their results on their Student Sheets.
3. **Graphing the Results.** Ask the students to graph the Trial-Two results by using a circle instead of an X. (Option: You may wish to have the students record the results of the trials using two different-colored pens.)

Making a Histogram of the Results.

Poll the students first to gather data on their Trial-One results. In each recovery-time column, place an X across from the value representing the number of students recovering at that time interval. Poll the students again for Trial Two using a circle to represent each minute of recovery time.

DISCUSSING THE RESULTS

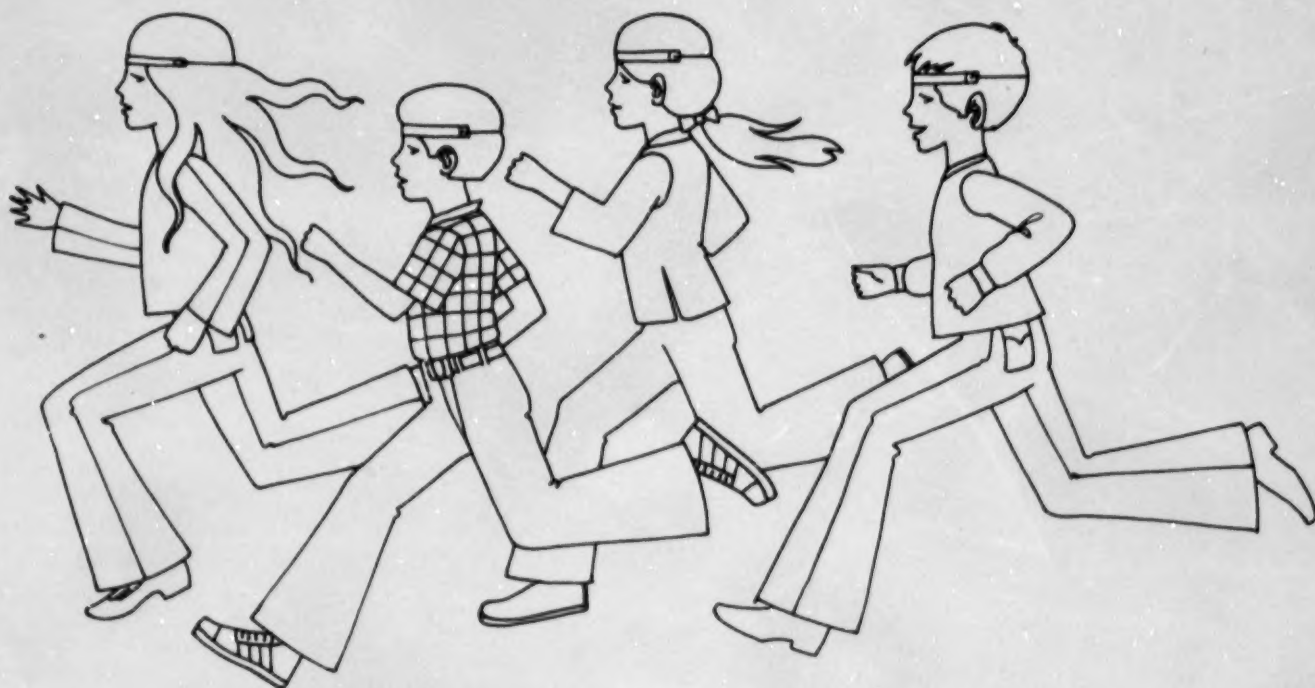
When the histogram is completed, discuss and compare both the range (fastest to slowest recovery time) and the most frequent recovery time for each of the trials.

1. How did you change your recovery time? Why do you think your technique worked? In what other situations could you use this technique?
2. During both trials what kinds of things could have affected your hand temperature? (Movement, touching other objects, starting temperature of the water, clothes, fat, wet hands.)

ICY CHALLENGE

1. Ask the students to compare the effectiveness of three different warm-up methods. Which technique works best (fastest)? Why?
2. Take your heart rate or pulse rate before and after immersing your hand in the ice bath for thirty seconds. How does the temperature of the cold water affect your heart rate? Does the temperature affect other students' heart rates in the same way?

THE GREAT HEAT ESCAPE



SYNOPSIS

The students discover that their bodies lose heat to the surrounding air. They also discover that perspiration increases this heat loss through evaporative cooling.

HEALTH BACKGROUND

The human body must maintain a narrow internal temperature range (slightly above or below 37° C) in order to sustain its normal functions. The body maintains this relatively constant core temperature by both producing heat and allowing excess heat to escape.

The skin constantly loses heat to cooler surroundings. In the absence of air currents, the radiated heat forms a layer of warmed air around the body. Air currents increase the heat loss by constantly replacing the warmed air layer next to the skin with cooler air from the environment. The amount of heat loss can be further increased through the evaporative cooling of perspiration.

Impairment of the body's normal heat-loss mechanisms or excessive physical exercise on a hot, humid day can result in a heat overload. Such an overload may produce heat exhaustion or heat stroke. Symptoms of heat exhaustion include a rapid weak pulse, profuse perspiration, nausea, and dizziness. Heat stroke occurs when the sweating mechanism is blocked. Heat stroke

victims have a rapid, strong pulse and hot, red, dry skin. Internal body temperature can soar as high as 43° C (110°F) and death may occur in a short time. By investigating the way their bodies give off excess heat, the students can become more aware of how the body regulates its temperature.

MATERIALS

For each student:

- 1 copy of the Student Sheet*

For the class:

- 32 HAP strip thermometers
- 1 "Using the HAP Strip Thermometer" Technique Card
- 32 HAP thermometer cups
- 32 elastic headbands
- 8 eight-ounce cups
- 32 alcohol pads
- liquid chlorine bleach*
- cotton*
- 1 half-gallon of warm water (40° to 45°C)*
- 1 duplicator master of the Student Sheet, "Taking Temperatures"

*Provided by the teacher

SETTING UP

Scheduling the Activity. This activity should follow *Map Your Temperature. The Great Heat Escape* may be completed in one fifty- to sixty-minute class period.

Preparing for the Activity

1. Make a copy of the Student Sheet for every student.
2. Sterilize each strip thermometer by wiping both sides with a weak, chlorine-bleach solution as described on the Technique Card.

THE ACTIVITY

Part One: The Body and Air Temperature

Introducing the Activity. Explain to the students that they are going to investigate the effect their body temperatures have on the surrounding air.

1. Give each student a copy of the Student Sheet.
2. Ask the students to predict whether or not their bodies warm the air around them and to mark their predictions on Part A of the Student Sheet.
3. Tell the students that in order to test their predictions, they are going to measure the temperature of the air close to their bodies (three centimeters away) as compared to the air around an inanimate object (a desk top).

Demonstrating the Use of the Thermometer Cups. Review the proper use of the HAP strip thermometer. (See the Technique Card.) Show the students how to measure air temperature.

1. Measuring Air Temperature Above a Desk Top.

- a. Insert the strip thermometer, numerals up, in the two slots found at the top (small end) of the temperature cup.
- b. Slide the strip thermometer so that the lit numeral is inside the thermometer cup.
- c. Place the base of the cup (large end) on a desk top, and observe the air temperature inside the thermometer cup for one minute. Tell the students that they may need to slide the strip thermometer in one direction or the other to keep the lit portion inside the cup. (Caution the students that breathing on the strip thermometer affects the temperature reading.)
- d. Tell the students that they will record this temperature on Part A of their Student Sheets.

THE GREAT HEAT ESCAPE

Student Sheet

Name _____

TAKING TEMPERATURES

PART A:

1. I think that I (do/do not) warm up the air around my body. (Circle one.)
2. The beginning temperature inside the thermometer cup is _____°C.
3. The air temperature inside the thermometer cup after it is held on the palm of my hand is _____°C.

PART B:

4. The forehead temperature before warm-up exercise is _____°C.
5. My predicted forehead temperature after warm-up exercise is _____°C.
6. The forehead temperature after warm-up exercise is _____°C.

**Map Your Temperature
Out in the Cold
The Great Heat Escape**

**USING THE HAP STRIP
THERMOMETER**

Technique Card

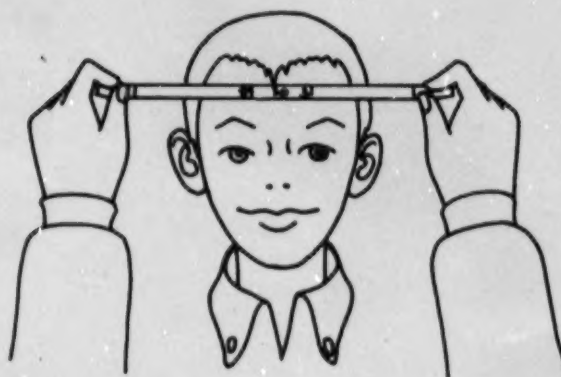
How It Works

The HAP strip thermometer is made up of a series of encapsulated liquid crystals, each of which is optically active within a one-degree Celsius range; i.e. they go through visible color changes only within that specific range. The different crystals are encapsulated behind the strip numerals that indicate the particular one-degree ranges. As you hold the strip against an object, the numerals sequentially light up until the temperature indicated corresponds to the object's temperature. The actual temperature of the object is the highest numeral lit that does not change color for at least ten seconds.

The different color changes that each numeral goes through reflect fractions of a degree. The crystals behind a numeral change from black to tan to green-blue to violet-blue. If a numeral stays tan colored for at least ten seconds, the exact value of the numeral (e.g. 26) is the temperature of the object. Green-blue indicates a half degree more (e.g. 26.5). The violet-blue indicates that the next temperature (27) is almost reached. The next Celsius degree is reached when this next number turns tan. As various temperatures are passed, the numerals remain violet blue.

Suggested Procedure

1. Work in pairs.
2. Using both hands, hold the strip by the orange tabs.

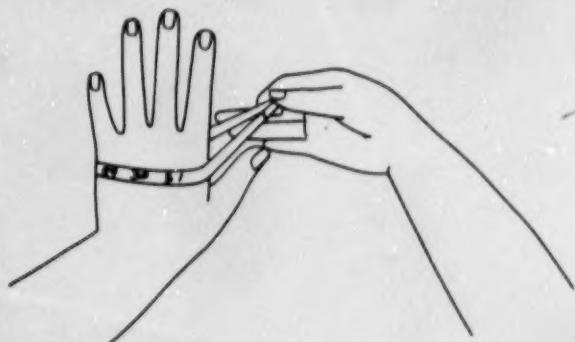


3. Press the strip, shiny side up, tightly against the surface of the object to be measured. (**Note:** Breathing on or touching the black portion of the strip will alter the temperature readings.)
4. As the numerals light up, slide the strip in one direction or the other so that the numeral currently lit is on the spot that you are measuring. Hold the strip firmly against the surface of the object until the highest numeral lit remains one color for at least ten seconds.

USING THE HAP STRIP THERMOMETER

Technique Card

5. **The Loop Technique.** This technique is useful when you can use only one hand to hold the strip thermometer, e.g. when you are measuring the temperature of the back of one hand, the forearm, etc. Form a loop with the strip thermometer by holding the orange end tabs together with one hand. (The shiny side of the strip should be on the outside of the loop.) Insert your arm, foot, or leg through the loop. The loop should fit tightly against the part of the skin being measured.



Care of the Thermometers

1. To prolong the life of the strip thermometers, do not expose them to direct sunlight, extremely high temperatures, or rapid temperature changes outside of the range of the thermometer. The strips can withstand freezing, but should be warmed up slowly. The optimum storage temperature for these strip thermometers is between 13°C and 37°C.

2. Brief exposure to cold water will not harm the strip thermometers, but *do not* soak them in water or put them in warm water.

3. Do not put tape on the back of the strips as the tape markedly decreases the sensitivity of the strips. In addition, any attempt to pull the tape off will loosen the crystals and destroy their usefulness. If, however, the orange ends of the strips become loose, a little transparent tape will repair them. *Do not* bend the strips or scrape the back sides; such treatment loosens and destroys the crystals.

Sterilizing the Strip Thermometers

1. Sterilize the strip thermometers before each use.

2. To make the disinfectant, add ¼ capful of chlorine bleach to eight ounces of cold water.

3. Dip a cotton pad into the disinfectant and wipe both sides of the strips.

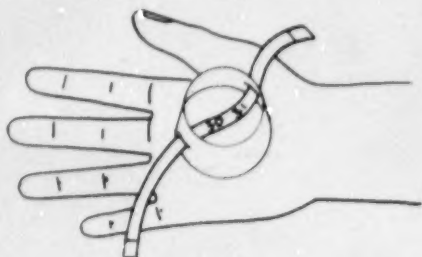
4. Rinse the strips by wiping them with a clean cotton pad that has been dipped in clear water.

5. Dry the strips and lay them out (shiny side down) on dry paper towels. Stacking the strips or storing them before they are thoroughly dry causes the strips to stick together. *Do not* use solvents such as alcohol or acetone; they will destroy the strips.



2. Measuring Air Temperature at a Distance of Three Centimeters from Your Body.

- a. Place the base of the cup on the palm of your hand. Again, make sure that the lit number is inside the cup.



- b. Tell the students that they will wait one minute, sliding the strip as necessary, and then record the temperature inside the thermometer cup on Part A of their Student Sheets.

Measuring Air Temperature

1. Distribute the strip thermometers and temperature cups. Challenge the students to find out how their body heat affects the surrounding air.
2. As you observe the students, help those having trouble, listen for their ideas about how hot they are, and watch for those who inadvertently breathe on their strip thermometers.
3. Ask the students what they have discovered as a result of performing this part of the activity. You may want to ask them where they think the heat comes from that warms the air inside the cup.

Part Two: Perspiration and Body Temperature

Introducing Part Two. Tell the students that they are now going to find out how exercise affects their body temperatures. Tell them that in order to find out, they will run until their foreheads perspire, and then measure their forehead temperature. (The exercise should be done at the same temperature you have been working under — room temperature or above — or the students may think that cold air is responsible for a lowering of skin temperature.)

Demonstrating How to Make and Wear Strip-Thermometer Headbands

1. Insert the metal tabs on the ends of the elastic headbands into the holes punched in the orange tabs on the strip thermometers.
2. The strip thermometer should be worn one to two centimeters above, and run parallel to, the eyebrows. The lit numeral of the headband should be centered in the middle of the forehead.



Doing Part Two

1. Distribute the elastic bands and direct the students to prepare the headbands.
2. When the students have assembled their headbands, ask each student to put on his headband and have a partner help him take his forehead temperature and record it on Part B of the Student Sheet. (**Caution:** If you have to go outside for the running exercise, temperature readings should be taken in the shade to be accurate.)
3. Ask the students to predict what their forehead temperatures might be after running until they perspire and to record their predictions on Part B of their Student Sheets. Poll the class, and record on the chalkboard the number of students who predict their temperatures will go up, their temperatures will go down, and their temperatures will not change.
4. Form teams of two students and lead the students in the running until they begin to perspire from their foreheads (at least one minute).
5. After the exercise, the partners should read each other's forehead temperatures and record them on Part B of the Student Sheets.

6. Now poll the class to determine how many students' temperatures increased during the warm-up exercise.
7. Compare the predictions with the number of youngsters who actually showed an increase in their forehead temperatures. How many showed a decrease in their forehead temperatures? Ask the students what they think happens to their skin that keeps their temperature from rising. If they don't bring it up, ask them what effect they think perspiration has on skin temperature.
8. **The Effects of Evaporation.** Distribute one cup of warm water to every four students and direct them to try the following procedure as you demonstrate it:
 - a. Breathe slowly on the back of your hand.
 - b. Put your fingers in the water to affirm that it is warmer than your hand.
 - c. Wet the back of your hand with warm water and again breathe slowly on it. Does that feel warmer or cooler than breathing on the back of a dry hand?
9. Give each of the students an alcohol pad and direct them to try the following procedure:
 - a. Wet the back of your dry hand with alcohol and repeat the breathing procedure. Does this feel warmer or cooler than when you tried the breathing procedure with water? (Caution: Warn the students that alcohol will damage the strip thermometers.)
 - b. Re-apply alcohol to the back of your hand. Observe what happens to the alcohol as it cools your hand. How fast does the alcohol evaporate compared to the water?
10. Encourage the students to discuss the effect of alcohol and water after they are placed on the skin. Then ask them how the rate of evaporation (how fast the liquid evaporates) affects the amount of cooling. (The faster evaporation of alcohol is responsible for its greater cooling sensation.)

DISCUSSING THE RESULTS

The following questions may help the students become more familiar with the concepts that the body radiates heat and that perspiration is a means of regulating body heat loss through evaporation.

1. What happens to the heat your body produces? What evidence do you have that your body warms the air surrounding you?
2. How does a breeze help your body feel cooler?
3. What do you think would happen to your skin temperature if you were not able to perspire on a warm day while exercising?

ADDITIONAL CHALLENGES

1. What happens to the temperature of your forearm when you cover it with plastic?
2. Find three places with different temperatures (e.g. in direct sunlight, outdoors in shade of trees, indoors). Do the same amount of exercise in each place and compare the amount you perspire in each. (Rest between trials until all previous perspiration has evaporated.)